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DAIRY-HERD TESTING IN NEW ZEALAND.

REVIEW OF 1925–26 SEASON.

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INTRODUCTION.

FOR the season of 1925–26 dairy-herd testing in the Dominion has shown a decrease in the number of cows under test as compared with the preceding season, when the greatest number in the history of the movement in this country since its inception in 1909 was recorded. On the basis of all cows under herd-test which were tested two or more times the 1925–26 figures stand at 169,776, as against 196,850 for the preceding season, representing 13·0 per cent. and 14·9 per cent. respectively of the Dominion's total of all dairy cows in milk and dry for the years specified. The decrease amounts to 27,074 cows, or 13·8 per cent. on the number of cows under test for the 1924–25 season.

This decrease, although considerable, must not be viewed with serious misgivings. Herd-testing in New Zealand since the close of the Great War has been increasing very rapidly year by year, and it would seem that a stage has now been reached when a steadying-up in the progress of the movement is likely to be evidenced. Viewed in the light of the progress of herd-testing in certain countries where the movement commenced at earlier dates, it would appear that we are only experiencing a similar temporary decrease to those experienced by the others. Moreover, the total of dairy cows in milk and dry in the Dominion has decreased from 31st January, 1925, to 31st January, 1926, to the extent of 19,576, or about 1·5 per cent. This must have had some influence on the position, and in conjunction with the rather unsatisfactory dairying season experienced in 1925–26 may account for much of the decrease. However, group herd-testing shows an increase of 5,172 cows, the totals being 105,227 for 1925–26 and 100,055 for 1924–25. Furthermore, the number of cows under test in the Southland Land District has risen from 3,393 in 1924–25 to 8,220 in 1925–26, or 142 per cent.

It is gratifying to record such an increase as this, but, although the work has been taken up in many other new districts also, the

position is offset by the fact that herd-testing has fallen off in some of the older testing districts, with the result that all the principal land districts concerned show decreases. One factor which has operated in this direction is doubtless the tendency on the part of a number of dairy-farmers to test their cows for one season, and not to trouble retesting any whose yields are considered satisfactory in comparison with the yield of the average cow in the herd. Such dairymen often rejoin the association or group after a couple of years or so, and as, in their opinion, the reconstitution of the herd makes it necessary. Other dairy-farmers, after testing the herd for a season and culling out their lowest producers, test the following season only those individuals still considered doubtful, or which have been brought in as heifers, or as cows purchased in order to maintain the numerical strength of the herd.

If a dairy-farmer cannot see his way to test his whole herd each season, the testing of all females added to the herd should certainly be undertaken. This not only keeps the owner more up to date with respect to data regarding the producing-capacity of the individuals in his herd, but it also assists materially in ensuring the continuity of the association year by year. It cannot be gainsaid that a herd-testing association is an asset to a district, and that a district sustains a distinct loss when its association or group lapses through insufficient support.

In view of the irregularity in testing referred to, the total number of cows under test in any one season, therefore, cannot be taken as a correct index of the number of tested cows in the Dominion's dairy herds.

COLLECTION OF DATA.

Ever since the inception of dairy-herd testing in the Dominion the Department has been collecting data in regard to the number of all cows under test each year, and seasonal production figures for only those associations controlled by officers of the Dairy Division. It was not until four years ago that the collection of seasonal production data from all herd-testing organizations operating throughout the Dominion was undertaken. The Dairy Instructors for the various districts report to the head office of the Dairy Division what herd-testing bodies, &c., are operating in their respective districts, together with the number of cows under test. This return, in addition to correspondence on file with various existing and intending associations, provides a list which, although it may not be absolutely complete, is as nearly so as possible. No account is taken of cases where dairymen are doing their own testing, as the collection of information on these lines is not very feasible. Since, however, many dairy-farmers have their own testing appliances, quite a lot of this work must be going on.

With the aid of this list all herd-testing bodies are circularized each year with a request to supply a seasonal production summary for all tested cows in milk 100 days or over since calving, but not exceeding 365 days, and to confirm the number of cows tested twice or more. Needless to say, the work is attended with many difficulties, but through the co-operation of the various testing bodies fairly complete information on a uniform basis has been collected each year. We

would like to here record our appreciation of the ready manner in which our requests have been met, and to thank all those who have supplied annual summaries of results.

SYSTEMS OF TESTING IN OPERATION.

As outlined in some detail in last year's review (*Journal* for October, 1925), dairy-herd testing in New Zealand is conducted under practically three distinct systems—namely, "Association," "Group," and "Dairy Company." Under the Association system members do their own weighing and sampling of their cows for two days (in a few cases one day) out of every thirty days, while in the case of the Group system weighing and sampling of cows is done by a testing officer for one day every month. In both cases samples are tested by testing officers, returns figured, and sheets returned to the dairy-farmers. Testing under the Dairy Company system follows the Association method, except that the figuring of returns is left to the herd-owners themselves.

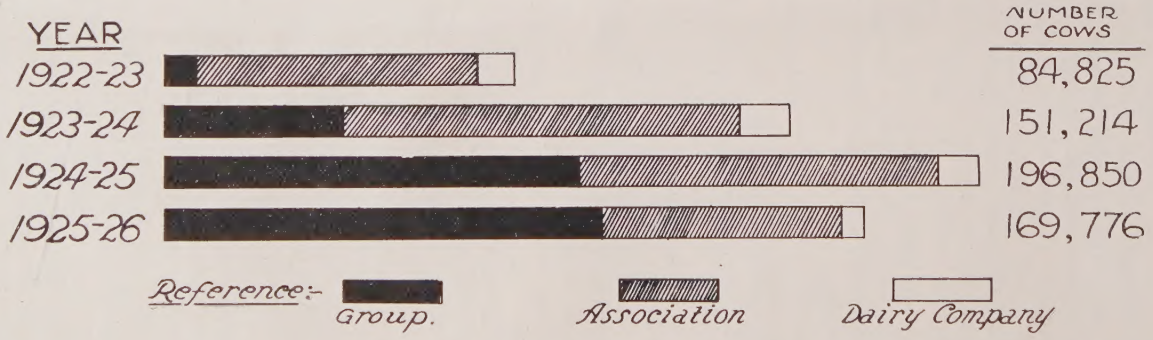
EXTENT OF TESTING.

The number of cows tested twice or more for the past four seasons, grouped according to the three systems of testing in operation as described in the preceding paragraph, is given in Table 1. Together with the table, a graph covering the same period is shown, which should give a better idea of the relative extent of herd-testing not only as a whole, but also according to system. As previously stated, a decrease in the number of cows under test for the 1925–26 season has occurred. It will be noticed that the decrease is manifested in those portions of the testing-work operating under the Association and Dairy Company systems. In fact, the decreases in the number of cows under test for these two systems date back for the past two seasons. Group herd-testing, however, shows a moderate increase for the year, more than maintaining its former position in spite of the factors which have produced a decrease in the total volume of testing. The Association system, although it has decreased as far as total and average number of cows tested is concerned, has actually increased in the number of associations, the 1925–26 total being the highest to date. The number of groups has decreased, but is more than counterbalanced by the increase in the average number of cows per group. It would appear from the points revealed, and other information, that the Group system is replacing the Association system to some extent in the more intensive dairying districts, while the Association system is finding favour in the less specialized dairying areas.

In order to follow the trend of herd-testing by districts for the past four seasons Table 2 has been prepared. The districts correspond with the land districts, as used by the Government Statistician in classifying agricultural and pastoral statistics. For this reason the division is a more useful one than if done according to provinces. For reference the boundaries of the various land districts as used in this classification are shown in the accompanying map featuring the distribution of herd-testing. It will be noticed that the South Island figures have been subdivided this year. This has been done mainly for the reason that the amount of herd-testing in Southland has now

Table 1.—Numbers of Cows tested Twice or more, classified according to Season and System of Testing.

System.	1922–23.			1923–24.			1924–25.			1925–26.		
	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.
Association ..	90	67,835	754	114	96,198	844	117	87,695	750	124	59,345	479
Group ..	6	7,500	1,250	34	43,144	1,269	91	100,055	1,100	86	105,227	1,224
Dairy Company	46	9,490	206	42	11,872	283	51	9,100	178	38	5,204	137
All ..	142	84,825	597	190	151,214	796	259	196,850	760	248	169,776	685



GRAPH SHOWING THE EXTENT OF HERD-TESTING IN NEW ZEALAND FOR LAST FOUR YEARS—AS A WHOLE AND ACCORDING TO SYSTEM.

Table 2.—Number of Cows tested Twice or more, classified according to Season and Land District, &c.

Land District, &c.	1922–23.		1923–24.		1924–1925.		1925–26.	
	Cows tested Twice or more.	Percentage of Total Cows in Milk.†	Cows tested Twice or more.	Percentage of Total Cows in Milk.†	Cows tested Twice or more.	Percentage of Total Cows in Milk.†	Cows tested Twice or more.	Percentage of Total Cows in Milk.†
North Auckland ..	17,973	10·9	23,521	13·4	31,049	17·7	24,951	13·9
Auckland	32,123	12·1	63,945	22·1	93,912	32·5	77,651	25·1
Gisborne	2,419	10·2	3,122	11·9	4,022	14·9	3,891	14·5
Hawke's Bay	1,629	3·7	4,391	9·4	5,468	11·2	4,902	10·6
Taranaki	15,585	8·3	18,567	9·7	16,840	8·7	16,485	8·5
Wellington	12,962*	7·4	30,584	16·6	37,415	20·2	29,653	16·4
North Island ..	82,691*	9·6	144,130	15·8	188,706	20·7	157,533	16·8
Nelson	..	..	1,192	4·7	574	2·2	880	3·4
Marlborough	105	0·7	175	1·1	147	0·9	441	2·8
Westland	..	..	771	7·0	..	..	..	..
Canterbury	1,400	1·6	2,345	2·7	2,171	2·6	1,799	2·4
Otago	499	0·9	2,416	4·3	1,859	3·5	903	1·8
Southland	130	0·2	185	0·2	3,393	4·8	8,220	12·5
South Island ..	2,134*	0·8	7,084	2·6	8,144	3·1	12,243	5·0
Dominion	84,825	7·5	151,214	12 8	196,850	16·5	169,776	14·4

* Amended returns. † As at 31st January.

reached proportions worthy of individual comparison with the various North Island land districts. In fact, as mentioned in the introduction, Southland is the only district showing an increase for the past season.

As in our last review, the percentages quoted are on the basis of all cows in milk only, and as at 31st January of the respective years. This appears to be a preferable basis to that of all dairy cows in milk and dry as at the respective periods, since cows dry at this time of the year are more than likely not available for testing, as they would in all probability have been too long in milk at the usual date of commencement for the herd-testing season. For the 1925–26 season it will be observed that in the North Island one cow in every six was tested, while in the South Island only one in every twenty was so accounted for. For the Dominion one cow in every seven was tested in 1925–26, whereas the corresponding 1924–25 figures showed one in six.

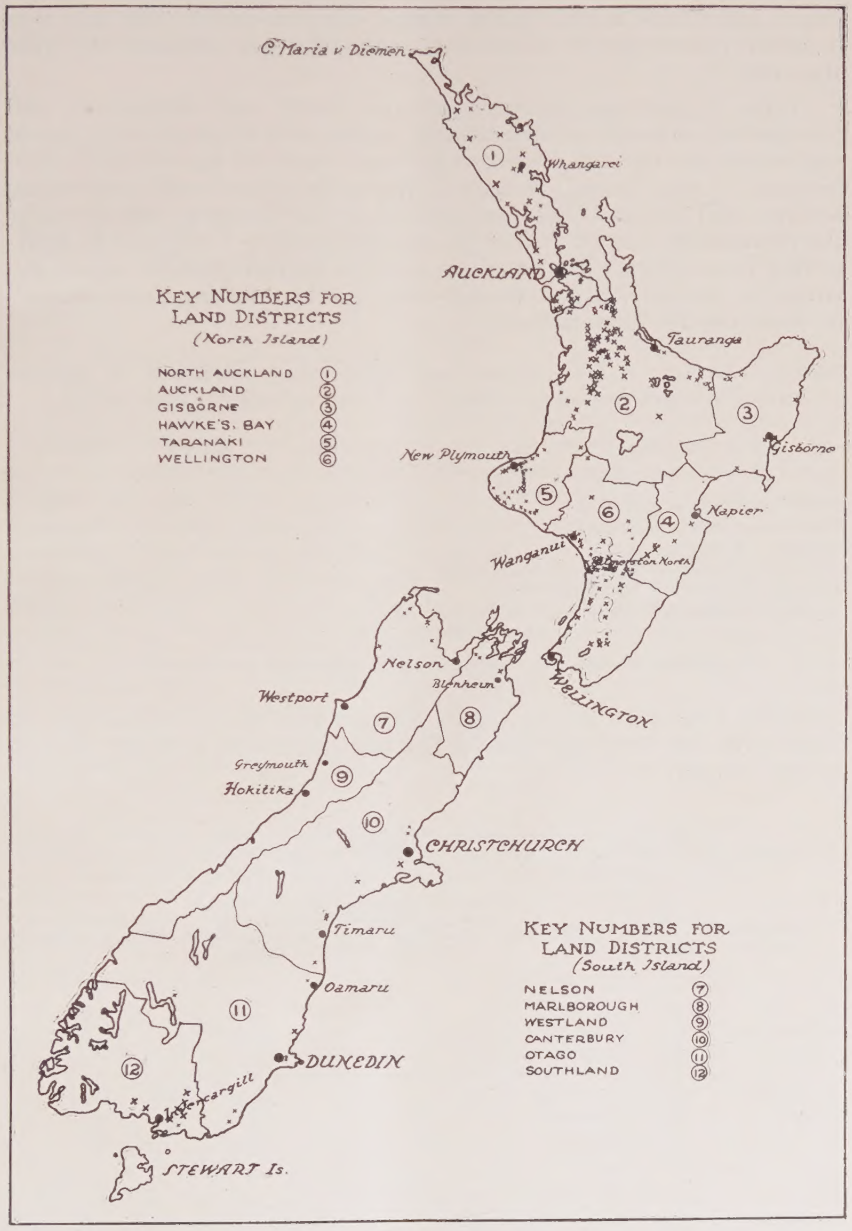
DISTRIBUTION OF TESTING.

For the purpose of added interest this year a map of New Zealand has been prepared showing by means of crosses the approximate location of herd-testing centres throughout the Dominion. By this means an indication of the distribution of herd-testing is provided. As would be expected, the areas covered correspond chiefly with the more intensive dairying districts. Boundaries of land districts are also shown, and this information, studied in conjunction with that contained in Table 2, should prove a useful supplement.

AVERAGE YIELD OF TESTED COWS.

Much useful information may be gleaned from annual summaries prepared from continued seasonal butterfat records, and the necessity for this work to be undertaken by each herd-testing body must be stressed. Quite apart from the value of these summaries when collected and reviewed, the information so obtained should prove of interest to the individual members of the respective herd-testing associations.

As mentioned earlier, in the paragraph "Collection of Data," production summaries have been collected by the Dairy Division for the past four seasons, and in regard to the 1925–26 season have been collected from practically every one of the associations and groups operating throughout the Dominion. Seeing that members are left to do their own figuring in the case of the Dairy Company system, summaries of these are not available. Their collection would mean obtaining a return from each member, and this would not be feasible. In only a few cases were the summaries received incomplete to such extent that they could not be utilized in our grand summary. Effective summaries received for the 1925–26 season represent 96·5 per cent. of the total number of cows tested twice or more for all groups and associations. Corresponding percentages for 1924–25 and 1923–24 are 91 and 92 respectively. The production summaries, as already indicated, are requested on the basis of all cows in milk 100 days or over, and the number of cows so represented in the effective summaries received for the past season total 146,398, as against 151,875 for the preceding season. Notwithstanding a decrease of 27,074 cows in the total cows



MAP SHOWING THE DISTRIBUTION OF HERD-TESTING IN NEW ZEALAND, SEASON 1925–26.

Each unit or section is shown by a cross. Boundaries of land districts are also shown.

tested twice or more, the decrease in the numbers as included in the grand summaries is only 5,477 cows. This is due to the fact that a higher percentage of satisfactory summaries was obtained this year than last.

Table 3 gives the numbers of cows, herds, and associations, and average size of herds and associations, represented in all effective annual summaries (on the 100-days-or-more basis) received for the past three seasons. "Association" as used in this table refers to all herd-testing sections, and includes those operated under the Group as well as under the Association system. There is, unfortunately, a confliction in herd-testing nomenclature, inasmuch as sections operating under either the Group or Association systems are termed "herd-testing associations," or, more briefly, "associations."

Table 3.—Numbers of Cows, Herds, and Associations represented in Effective Seasons' Summaries received. (Basis: All Cows in Milk 100 Days or over.)*

——	1923–24.	1924–25.	1925–26.
Number of associations	140	190	201
Number of herds	3,837	4,815	4,458
Number of cows	107,777	151,875	146,398
Average number of herds per association..	27	25	22
Average number of cows per herd ..	28	32	33
Average number of cows per association	770	799	728

* Including both Group and Association systems, and on basis of sections or units.

Table 4 presents information similar to that in the lower half of Table 3, except that the material has been separated according to the system adopted.

Table 4.—Average Size of Associations and Groups for which Effective Seasons' Summaries on the Basis of all Cows in Milk 100 Days or over were received.

System.	Season.	Average Number of Herds per Association or Group.	Average Number of Cows per Association or Group.	Average Number of Cows per Herd.
Association ..	1923–24	28	641	23
	1924–25	25	574	23
	1925–26	19	407	22
Group ..	1923–24	25	1,203	48
	1924–25	26	1,185	45
	1925–26	27	1,205	44

Table 5 represents grand summaries of results for the past two seasons. The average production shown in similar tables for the 1923–24 and 1922–23 seasons was 213·01 lb. butterfat in 230 days and 233·71 lb. in 225 days respectively. The past season's figures show a decrease of about 3 lb. of butterfat, which must be considered satisfactory in view of the fact that the 1925–26 season was not as favourable as 1924–25.

Table 5.—Grand Summary of all Effective Herd-testing Results on the Basis of all Cows in Milk 100 Days or over received for the Last Two Seasons.

	1924–25.		1925–26.	
	Days in Milk.	Pounds of Butterfat.	Days in Milk.	Pounds of Butterfat.
Average for all cows (151,875 in 1924–25 and 146,398 in 1925–26)	229	223·54	230	220·51
Highest Association or Group average ..	259	319·78	263	323·24
Lowest Association or Group average ..	169	154·13	168	153·14
Highest herd average	308	442·25	233	500·21
Lowest herd average	130	38·78	125	51·69
Highest cow	365	870·07	286	819·85
Lowest cow	223	28·61	120	11·13
Average daily production of butterfat for all cows	..	0·98	..	0·96

Table 6 supplies a comparison of average production according to system of operation. Earlier in this article, when considering the numbers of cows tested under the two main systems, the idea was expressed that the Association system was going out in some of the more intensive dairying districts where groups were now operating, and was finding favour in the more outlying districts. The result of this is evidenced in Table 6, since on the one hand the Association system average has decreased considerably, while on the other hand the Group average has increased just a little notwithstanding the unfavourable season. It need not be emphasized that dairy cows in the more intensive dairying districts are, on the average, considerably more productive than those in the outlying districts. There are two main reasons for this—quality of stock and land—and both operate in the one direction.

Table 6.—Average Production of all Effective Results for Past Two Seasons classified according to System. (Basis : All Cows in Milk 100 Days or over.)

Year.	System.	Number of Associations or Groups.	Number of Herds.	Number of Cows.	Average Days in Milk.	Average Butterfat.
						lb.
1924–25 ..	Association	120	2,968	68,914	221	224·75
	Group ..	70	1,847	82,961	235	222·54
1925–26 ..	Association	120	2,239	48,823	217	215·40
	Group ..	81	2,219	97,575	236	223·06

As pointed out in last year's review, comparison of average production year by year is difficult, and deductions are to be made with the greatest care and only after the data have been viewed from all angles. Associations as well as individual herds drop out or come in for the first time from year to year, and unless comparison of results is made for the same herds only in each case, and due allowance made for variation in nature of the seasons, increase or decrease in production cannot be properly shown. Even when such comparisons are prepared,

the problem of just how much to allow for difference in nature of seasons is one which is difficult of satisfactory settlement.

It will be noticed, moreover, that a difference exists in the average length of time cows are under test in the case of the two systems of testing—Group and Association. Reference to Table 6 will make this readily apparent; but now that the Association system is tending more towards the sparser dairying districts than formerly this difference is likely to increase, since cows in these districts are, on the average, of a poorer type, and, moreover, are generally kept on poorer land. This difference manifests itself even where a group and an association are operating side by side, and is due to the fact that under the Association system some dairy-farmers, after weighing and sampling for a fair number of months, cease a little sooner than do most groups, because of the time taken up in this work being considered of more value than further periods of testing at a time when cows are producing at a low rate and further testing is unlikely to alter the order of the individual records to any appreciable extent, despite the fact that some cows on long-time test show up to better advantage than on shorter periods. This difference in the average length of time over which associations and groups operate during a season affects the grand summary of results, for the reason that different proportions of results obtained under the two systems are included each year. Due allowance, therefore, has to be made for this fact in comparing one year's grand summary with that of another.

The Dairy Division has, in regard to those associations which are tested by its officers, made a practice of compiling production summaries on the basis of all cows in milk 210 days or over, as well as on the basis of 100 days or over. This type of summary has certain advantages, inasmuch as it provides an indication of production over a period more consistent with that of the length of a dairying season. The 100-days-or-more summary has the advantage that it includes records for some cows of such poor quality that their lactation periods fall short of 210 days. It has the disadvantage, however, of including records of cows that have died, fallen sick, been sold, or discontinued considerably before their testing would have been completed. Table 7 supplies a comparison of results on the two bases, and has been compiled from all data for the past four seasons resulting from association testing-work conducted by the Division's officers.

Table 7.—Average Production for Associations conducted by Officers of the Dairy Division, comparing Difference in Production between Results of Summaries compiled on the Basis of all Cows in Milk 100 Days or more and 210 Days or more.

Year.	100 Days or more.		210 Days or more.	
	Average Days.	Average Butterfat.	Average Days.	Average Butterfat.
		lb.		lb.
1922–23	227	232·99	261	271·48
1923–24	227	221·39	258	267·10
1924–25	223	231·51	258	266·29
1925–26	218	221·19	257	259·20

About 65 per cent. of the records appearing in the 100-days-or-over summary are for periods of 210 days or over, and together constitute the respective averages as shown under the 210-days heading. In other words, 35 per cent. of the records in the 100-day column are for periods between the limits of 100 and 210 days. It must not be accepted, therefore, that the differences in production under the two bases represent the amount of butterfat produced in the number of days represented by differences in average days in milk. It may be assumed, however, that, for records compiled under the Association system, 100-days-or-over and 210-days-or-over summaries will bear out similar differences as evidenced in this table, and the proportions represented may be safely utilized for the purposes of obtaining, from 100-days-or-over figures available, estimates on a 210-days-or-over basis. The proportions, however, would not hold true as well in the case of groups. Here the percentage of cows in a 100-days-or-more summary, whose records lie between 100 and 210 days, would be considerably less than in the case of the Association system.

In order to compare average production for the past three years by land districts Table 8 is presented. As in the case of Table 2, the figures for Southland are now worthy of being shown separately, and the other South Island districts have been brought into line also, although the percentages of the total cows in milk represented in these averages are too low to be significant, and therefore should not be used to any extent for comparative purposes. All the North Island districts and Southland are represented by fairly significant percentages, and the respective averages may be considered to represent roughly the relative difference in production for all dairy cows in these districts. Of course, allowance must be made for appreciable differences in the percentage of all dairy cows so represented in each case. It would not be absolutely correct to say that Auckland, with 23·7 per cent. of that land district's total dairy cows in milk represented in the figures shown for 1925–26, is about 16 lb. of butterfat, or 6·5 per cent., lower in average production than Taranaki, since the Taranaki figures are for only about a quarter of Auckland's percentage. The figures for Auckland must include a greater percentage of the poorer dairy cows of that district than in the case of Taranaki, since herd-testing is first of all taken up by the more progressive dairymen, and these usually own better-quality herds. As the movement progresses more and more it would be fairly safe to assume that new herds joining up represent, on the average, poorer and poorer quality herds at each stage. Provided the testing in the various districts is not confined to principally one locality, the averages in this table should be representative samples of the dairy cows in the respective districts. From the map showing distribution of testing, however, it will be observed that all the North Island land districts and Southland are well represented.

All averages shown in the table are undoubtedly on the high side as representing average production for all dairy cows. The remaining herds in each case represent, on the average, herds of poorer quality. Some of these herds will have been tested previously, but the larger proportion will not have been tested at all, and will, in the majority of cases, be of a lower producing standard. It is considered, however, that relatively the comparison will be fairly correct for those land

Table 8.—Average Production, according to Land Districts, &c., of all Cows under Herd-test for which Effective Seasons' Summaries were obtained. (Basis: All Cows in Milk 100 Days or over.)

Land District, &c.	1923–24.				1924–25.				1925–26.			
	Average Days.	Average Butterfat.	Cows in Summary.	Percentage of Total Cows in Milk.*	Average Days.	Average Butterfat.	Cows in Summary.	Percentage of Total Cows in Milk.*	Average Days.	Average Butterfat.	Cows in Summary.	Percentage of Total Cows in Milk.*
		lb.				lb.				lb.		
North Auckland ..	219	200·23	16,270	9·3	216	205·14	25,685	14·3	224	210·94	20,925	11·6
Auckland	234	207·86	48,253	16·7	235	224·98	77,003	25·7	236	226·08	73,101	23·7
Gisborne	209	202·16	2,026	7·7	204	208·34	3,455	12·8	212	191·03	3,368	12·5
Hawke's Bay	231	228·34	1,790	3·8	243	233·25	4,575	9·4	224	189·32	4,294	9·2
Taranaki	233	246·66	13,377	7·0	233	251·58	11,683	6·0	235	242·42	12,846	6·6
Wellington	237	215·60	22,402	12·1	228	230·99	24,199	13·0	223	212·64	22,043	12·2
North Island ..	232	213·56	104,118	11·4	230	224·48	146,600	15·7	231	221·11	136,577	14·6
Nelson	195	204·93	235	0·9	258	283·16	104	0·4	192	207·16	609	2·4
Marlborough	..	..	..	..	..	..	..	..	..	..	..	..
Westland	..	..	..	..	..	..	..	..	..	..	..	..
Canterbury	191	199·76	1,483	1·7	196	213·15	909	1·1	195	217·21	391	0·5
Otago	196	193·73	1,819	3·2	204	203·04	1,249	2·3	218	223·60	804	1·6
Southland	204	210·91	122	0·2	191	187·28	3,013	4·2	217	211·14	8,017	12·2
South Island ..	194	197·47	3,659	1·3	197	197·36	5,275	2·0	214	212·15	9,821	4·0
Dominion	230	213·01	107,777	9·1	229	223·54	151,875	12·7	230	220·51	146,398	12·4

* As at 31st January.

districts particularly mentioned. A rough indication of the average production of all cows in each case will be given by taking about four-fifths of the average butterfat figures shown in Table 8. Hawke's Bay shows a big drop in average production for the past season, and this only goes to show how unfavourable the season was in this case. Wellington, Taranaki, and Gisborne show considerable decreases also, while the average production for all tested cows in North Auckland, Auckland, and Southland has increased. The increase for Southland is probably not very significant, for the reason that the majority of the results for 1925 26 are from intensive dairying localities, whereas formerly these parts were represented proportionately to a much lesser extent. The advent of Group herd-testing has had an effect on the average production figures for other land districts also. However, the inclusion of Group herd-testing figures may influence results otherwise than in the case of Southland. For instance, the average production for Hawke's Bay in 1924–25 for the same associations as the previous year would have been 243 lb. of butterfat instead of 233 lb., Group testing results being included that year for the first time. Taranaki includes results for three groups in 1925–26, whereas formerly herd-testing was conducted entirely under the Association and Dairy Company systems. Auckland, North Auckland, and Wellington, however, have Group figures included for each of the three seasons shown in the table, and in the case of Gisborne for the past two seasons.

Table 9.—Percentages of Dry Cows to Total Numbers of Dairy Cows in Milk and Dry for Past Four Seasons in Chief Land Districts concerned.

Land District, &c.	31st January, 1923.	31st January, 1924.	31st January, 1925.	31st January 1926.
North Auckland ..	11·2	11·3	11·9	10·6
Auckland	9·0	8·0	7·4	6·8
Gisborne	12·6	15·0	14·9	16·4
Hawke's Bay	13·2	13·6	14·1	15·2
Taranaki	6·9	5·6	5·2	5·4
Wellington	9·5	9·9	9·6	10·3
North Island ..	9·4	9·1	8·9	8·7
Southland	8·4	8·5	10·3	10·1
South Island ..	11·5	11·9	12·2	11·9
Dominion	9·9	9·7	9·7	9·4

An interesting point in regard to the order of height of average production in the chief land districts concerned is shown in Table 9. The figures are self-explanatory, and may be taken as an index of the improvement effected in dairy herds in the various districts by culling, &c. The order of percentages in this table will be seen to closely follow the order of average production for tested cows shown in Table 8, in particular for the 1925–26 season. Taranaki and Auckland appear to be the only two districts which have been doing very effective work in eliminating unproductive dairy cows during the past few seasons.

(To be continued.)

LIVER-FLUKE IN SHEEP AND ITS CONTROL.

E. E. ELPHICK, M.R.C.V.S., Departmental Veterinarian, Hastings.

FOR a number of years past the mortality among sheep due to fluke infection in certain districts of the Dominion has been appreciable. The areas on which "flukey" sheep may be found have certainly extended, and will continue to extend if steps are not taken to control the parasite. Fortunately, a number of farmers are now realizing that the trouble can be curtailed, and are taking steps to bring about the desired effect. The results of their endeavours will be watched with interest, and their success should be a lesson to neighbours who are in many cases willing to let things take their own course.

As showing the seriousness which fluke disease may attain it is recorded that in 1910, in certain parts of France, the mortality among sheep from this cause reached 40 to 50 per cent. of the flocks. This was attributed to the wet season which characterized the end of that year.

LIFE-HISTORY.

The fluke is found in the bile canals and ducts of the liver. It may be found in other parts of the body, but its presence here is probably accidental. It is a flattened, flounder-shaped parasite up to about 1 in. in length, varying according to its age and sexual maturity. The life-history is a very complicated one, but a short account of it is necessary if control of the trouble is to be understood.

The eggs of the sexually mature fluke pass out in the animal's dung, and if passed on a swampy area or into water a ciliated embryo is hatched out. This embryo finds a species of fresh-water snail, and, after boring into it, develops a form knows as a cercaria. This resembles a very small fluke, but it has a tail which aids it to move about. This tail is lost, the cercaria encysts, and this encysted form attaches itself to a grass-blade or other vegetation which may be suitable. In a season like the one lately experienced on the East Coast the sheep do not stay on the dry hills, but come down to the wet areas not only for water, but for the succulent feed which is to be found only round these swampy flats. The encysted forms are swallowed by the sheep, take on a larval form in the stomach, bore their way into the liver through the liver capsule, and commence again their life-cycle.

SYMPTOMS.

The following short description will be useful to those sheep-farmers who are not familiar with the symptoms of liver-fluke: In the early stages (summer-time) the affected sheep are likely to improve in condition. This is only temporary, however. In the autumn the animal goes off its feed, stands apart from other sheep, does not appear so lively, and a loss of condition is noticeable. If examined, the membranes of the mouth and eyes are pale, and the same condition can be noticed in the skin. As the winter advances, œdematous swellings may be noticed under the jaws and along the belly. This condition is not constant, however, and the sheep may die without it being

apparent. The animals become feebler as the anæmia progresses, and finally die. If the infestation has not been severe enough they may survive the winter, and, as the flukes are said to leave the animals in spring, the sheep may be fattened sufficiently to get them off the place.

CONTROL MEASURES.

Treatment for expulsion of the fluke is satisfactory provided the infestation is not a heavy one. Efforts should be directed to prevent a continuance of the life-cycle. A remedy which has proved ofvalue is a preparation of male fern. This is best given in the form of the extract, and should be administered in a capsule. This preparation is often unstable, and a guarantee should be obtained, if possible, that the drug contains not less than 20 per cent. filicine and 3·5 per cent. filicic acid. The administration of a course of four doses of about 60 minims is recommended. The sheep should be without food for twelve hours before the administration, and the course cover a period of about a week. The sheep should be kept handy in a dry paddock away from water, so that the larvæ may not have an opportunity of hatching from the eggs. Where a flock is to be treated, this should be done about May, as the danger of fresh infection will probably be over by that time. Individual sheep should be either treated for fluke or slaughtered before they become emaciated and unfit for food.

As previously stated, efforts should be directed to break, if possible, the life-cycle of the parasite, and this can most conveniently be done by destroying the snail, a native species, which is the intermediate host. Natural enemies of the snail, such as the frog, also the native swamp-birds, might be encouraged, and carp or other fish of similar habit in larger standing areas of water. Where the snail is very much in evidence, however, it will be necessary to use drastic and quicker measures. If an area is too large to deal with chemically, probably the better plan would be to fence it off so that the sheep may not graze upon it. Such an area could be used later in the season for topping off cattle or sheep which are intended for the meat-works. Any area that can be conveniently drained should be drained, and in any case it is desirable that the flow of water be centralized, thus draining the borders and reducing the area to be treated, and, of course, the cost.

Frequently small areas of swampy land occur on the hillsides, and almost without fail the snail is found when a careful examination of the grass-roots or watercress (if present) has been made. No difficulty will be experienced, where cress is present and the water running fairly rapidly, to find the snail, but a much more thorough search will be needed to find it on the roots of the swamp-grasses.

Experiments conducted in England and America have proved conclusively that the use of copper sulphate, either in a spray or applied broadcast, is very efficacious in the destruction of water-snails. This material has two other advantages to recommend it: the percentage required is relatively small, and could do little damage to stock supposing they drank the water or fed on areas that had been even fairly recently treated; and it is also comparatively cheap—a few pence per pound. Experiments conducted by the Oregon Experiment Station showed that, after estimating the volume of standing or running water to be treated, the addition of 1 oz. of copper sulphate

FIG. 1. SWAMPY AREA IN HILL COUNTRY.

The low-lying ground in middle of view has been a typical breeding-ground for snails. A central drain has been made, running into the lake in foreground. Such good results have followed this work that only spraying will now be necessary for fluke-control.

FIG. 2. SOURCE OF AN EXTENSIVE SWAMPY AREA IN HILLY COUNTRY

Situated several hundred feet above sea-level. Hillside springs on left. This place is to be drained.

[*Photos by E. E. Elphick.*

to 7,800 gallons of water was sufficient to kill snails in forty-eight hours, but the treatment had to be repeated in two to three months' time to destroy the hatching eggs.

Spraying is very suitable for damp land—not necessarily actual swamp land, but land which has been drained and still retains water. This method is not suitable for hillside areas and inaccessible places, owing to the large quantity of material, to say nothing of the spraying-apparatus, which has to be transported. Spraying is rapid in its action on the snail, and the risk to sheep is very slight. A ½-per-cent. solution should be ample for country of this class, and the cost of spraying (not including labour) works out at 8s. to 10s. per acre. Wetter areas would require a 1-per-cent. solution, and the cost would be increased correspondingly. From 100 to 150 gallons of the solution per acre should be applied, the amount varying with the density of the grass.

For large swampy areas and hillside patches the broadcast method is the most suitable. If a drain can be cut through the swamp, this should be done, as before stated, because the drain concentrates the water and reduces the area to be treated. Particular attention should be paid to springs around the edges and at the source, as the treated water running from these eventually reaches the main channel and is carried down and spreads over swampy areas lower down.

All areas should be surveyed before commencing, and the work should be carried out systematically so that none are missed. The dressings should be made in December, if possible, and not later, and the stock removed from the paddocks which are to be treated, as there is more danger of poisoning following broadcasting than with spraying. Powdered copper sulphate should be used. It should be mixed with fine sand in the proportion of 1–4 for the neighbourhood of springs and the source of a swamp, and 1–8 for small swamp areas on hillsides, &c. A few pounds could be taken out on the saddle in a sugar-bag, and any small areas that are holding snails could be hand-dressed when doing the ordinary rounds of the sheep.

All sheep dying from fluke disease should be buried, and not left to rot near a water source or swamp. Any liver found to contain fluke should either be buried or burned.

Since the foregoing was written an article by R. F. Montgomerie, D.Sc., F.R.C.V.S., University College of North Wales, has appeared in the *Journal of Comparative Pathology and Therapeutics*, in which the writer advocates the use of 1 c.c. doses of carbon tetrachloride in capsules for fluke disease. A large number of experiments carried out by him gave very good results.

Tobacco-growing in New Zealand.—The annual report of the Horticulture Division for 1925–26 states: "Considerable interest is still being evinced in the cultivation of tobacco as a commercial proposition, and a steady increase is noticeable in the area planted in this crop. It has been amply demonstrated that leaf of high-grade quality for pipe-smoking can be produced in certain localities in the Dominion, notably Nelson, Hawke's Bay, and Auckland. It is estimated there are now some 400 acres under cultivation, the crop being grown under contract to tobacco-manufacturers. The continued improvement that has taken place in the manufacture of locally-grown tobacco has led to a considerable demand for the New Zealand product."

GALLOWAY IRRIGATION FARM.

I. ESTABLISHMENT AND INITIAL OPERATIONS.

R. B. TENNENT, N.D.D., Instructor in Agriculture, Dunedin.

SITUATED some five miles from the town of Alexandra, the Galloway Irrigation Farm lies in the heart of the semi-arid region of Central Otago. Its area comprises approximately 149 acres, of which 89 acres are served by water brought by races from the Manorburn Dam. Central Otago, on account of its limited rainfall, ranging from 13 in. to 20 in. per annum, is dependent to a very large degree on the application of irrigation water for the successful growing of crops and pastures. As a result of this necessity several Government and private irrigation schemes have been established with a view to making ample provision of water. With the advent of irrigation on modern lines the Department of Agriculture therefore decided to establish an irrigation farm, where certain practices under the comparatively artificial conditions of irrigation could be tested.

It was realized that although irrigation was of great antiquity its practice necessitated considerably more energy and forethought than farming under ordinary humid conditions. Bearing in mind that the average settler in Central Otago knew very little of applied irrigation, it was recognized that the establishment of a farm on a typical piece of Central Otago country, where modern practices could be demonstrated and definite investigations made, would be of decided value to the irrigation districts.

After careful consideration had been given of the different soil conditions and grades of country typical of Central Otago, a portion of the Galloway Station was selected as being ideal for the purpose of experimentation, in that all types of soil and grades of country common to the district were represented.

THE FARM AND ITS SCHEME OF WORK.

Although situated in the midst of the mica-schist region of Central Otago, the Galloway Irrigation Farm has not a typical mica-schist soil, nor has the surrounding country the usual topography generally found in schist regions, except where the farm skirts the foothills of the Raggedy Range. The reason for this peculiarity of Galloway Flat lies in the fact that the soil consists largely of lacustrine and fluviatile deposits mingled with igneous rock-flour and what are probably ice-borne boulders. These stones, often of considerable size, and not always definitely river-worn, are almost entirely foreign to the locality, and must originally have come from the western part of the Lakes district, this being proved by comparison of their composition with that of the country rock of western Otago. A classification of the soils on the Galloway farm therefore becomes difficult, bearing in mind the variety of constituents which have gone to form the surface.

The land comprising the farm is mainly at two levels, the lower fields being flat and part of the recent flood-plain of the Manuherikia

River, while the upper levels are above the Government main race. On the slope between the two levels is a small terrace on which, where it widens out to form a gully cutting into the old lake-bed, stands the farm steading.

On the upper level, above the race, is an area of what appears to be a comparatively rich black soil several inches in depth, but owing to the absence of water it is at present practically unproductive. On the faces between this flat and the race bare shingle appears, owing to the finer materials having been washed down to the lower levels. Below the race, where water can be turned on to this bare shingle, quite good grazing-ground can be formed, as the plant-roots, &c., have the effect of binding the soil, thus making it more retentive and greatly enhancing its production. Still lower down

FIG. 1. VIEW OF GALLOWAY FARM TAKEN FROM ABOVE THE MAIN IRRIGATION RACE.

Note the absence of trees on the distant plains, and the young shelter-belt on the farm.

the faces, on a small terrace which probably marks the level of an earlier flood-plain of the Manuherikia, about 3 in. to 5 in. of good soil is found, overlying an average of 7 in. of silt and clay, which in its turn is followed by gravel consolidated by river-silt. On the flat, lower levels of the farm the soil has a large proportion of gravel and stones, without the appearance of the clayey subsoil which characterizes the upper fields.

An interesting feature which attracts attention is that in the gullies which intersect the high terrace there is a marked variation of soil. On the northern faces there is a depth of 8 in. to 10 in. of rich black soil, now covered with a luxuriant growth of clover and grasses, while on the southern face very little soil at all, but rather bare consolidated gravel, appears with little or no plant-growth. This may be accounted for by the prevailing rain-bearing winds, which, beating on the southern faces of the gullies, wash the soil away.

When Galloway farm was taken over by the Department in 1921 the vegetation existing thereon was of an extremely sparse nature, the country being practically denuded, and carrying roughly one sheep to 10 acres. What growth did exist was comprised largely of the desert poa (*Poa maniototo*), scabweed (*Raoulia lutescens* and *australis*), Californian thistle (*Cnicus arvensis*), desert colobanth (*Colobanthus brevisepalus*), hair-grass (*Aria caryophyllea*), wild geranium (*Erodium cicutarium*), stinkweed (*Gilia squarrosa*), abundance of sorrel (*Rumex Acetosella*), and other vegetation of a similar nature. The place in its naturel state, as can be seen from the accompanying photograph (Fig. 1), looked most uninviting, and it was difficult to realize that with the application of water an apparently sterile piece of country would respond by growing excellent crops.

FIG. 2. TYPICAL GALLOWAY LAND BEFORE THE COMING OF IRRIGATION.

Sparse vegetation, consisting of desert poa, scabweed, hair-grass, wild geranium, stinkweed, and sorrel. Stones numerous. Carrying-capacity, one sheep to 10 acres.

At this early stage of the farm's history the proposed scheme of work was as follows:

(1.) Determination of the best method of distributing irrigation water, paying special attention to the cost of labour involved in the distribution, and of the economical use of water.

(2.) Crop trials to determine what crops would most profitably grow under irrigation in Central Otago. This work to include careful crop-costing.

(3.) Experiments to determine the cultural and water requirements of crops under irrigation.

(4.) Attention to drainage problems which might probably arise consequent on irrigation.

(5.) Investigation of alkali in Central Otago soils.

(6.) Investigations of dry farming or any other methods of cultivation on that portion of the farm which cannot be irrigated.

DAIRY-FARMING.

With the foregoing initial programme of work in view operations commenced, but in the course of time financial considerations, and the impossibility of obtaining the services of a well-trained investigator to reside on the farm, resulted in the original programme of investigations being considerably modified. Shortly after the inception of the farm it became apparent that a very definite demonstration of dairy-farming in irrigated country would be most desirable, with a view to ascertaining its possibilities on comparatively small holdings, and at the same time giving a lead to other settlers desirous of taking up this type of farming. The somewhat precarious and unstable condition of the fruit industry emphasized the necessity of utilizing irrigation areas for other purposes besides fruitgrowing, and dairying offered the most reasonable likelihood of an assured income and comfortable livelihood. The chief work at present being carried out at Galloway Irrigation Farm, therefore, is the production of butterfat.

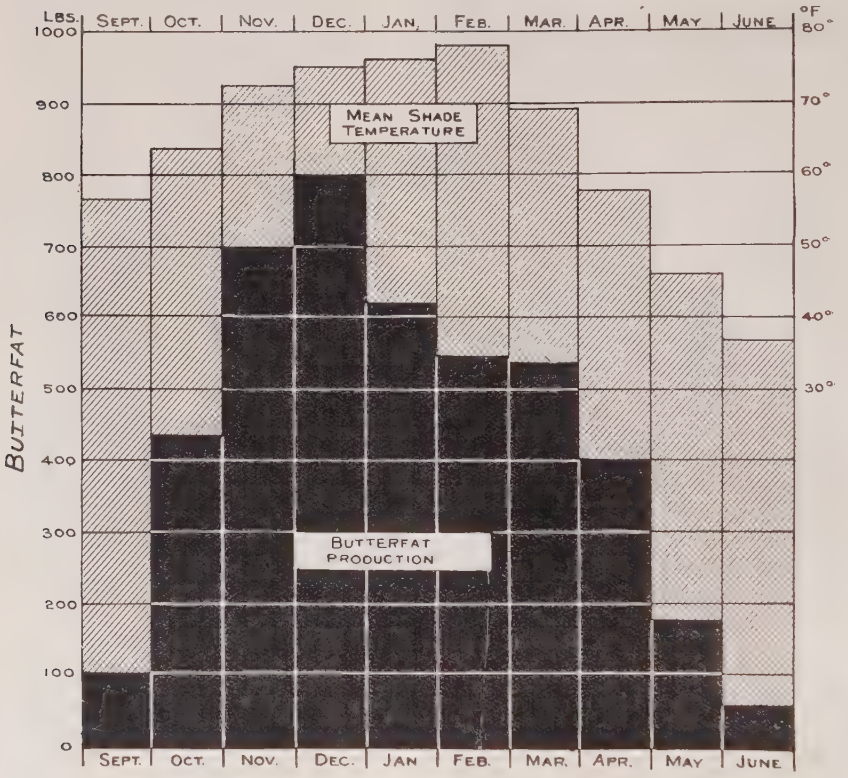
The dairy herd at the time of writing is in the main composed of purebred Ayrshire cattle. In all there are fifty-seven head of stock on the farm, of which thirty are Ayrshires, four Red Polls, and the remainder crossbred animals. The policy is the establishment of a high-producing herd of Ayrshire cows, and to this end stock of some of the leading southern breeders has been obtained, the progeny of the herds of Messrs. A. S. Weir, Irvine, Herron, and Ireland being well represented.

The Ayrshire appears to be ideally adapted to Central Otago conditions. Its hardy nature is eminently suited to the rigorous conditions prevailing throughout the winter months, when very heavy frosts are experienced. The breed winters exceptionally well on lucerne hay alone, and when given a fair ration of this feed the cows invariably "come in" in the spring in first-class condition. That such is the case is very fortunate, in that the growing and conservation of lucerne hay in Central Otago is a much more attractive and assured proposition than the growing of root crops.

Testing has been carried out regularly on the farm, and thus individual records of each cow are known. Culling the unprofitable animals will be carried out as soon as full stocking-capacity has been reached, thus assuring the rapid establishment of a herd of average high producers. The production of the herd at present is only moderate, last year's average being 238·26 lb. butterfat per cow. It is interesting to note the monthly returns of butterfat from the herd for the past season, together with the minimum temperatures recorded, as shown in the following table:—

Month.	Yield of Butterfat.	Shade Minimum Temperature.	Month.	Yield of Butterfat.	Shade Minimum Temperature.
	lb.	F.		lb.	F.
September, 1925	106·13	57°	February ..	550·46	78°
October ..	438·38	64°	March ..	541·65	69°
November ..	704·54	72°	April	402·66	58°
December ..	807·83	75°	May	184·68	46°
January, 1926 ..	620·46	76°	June	50·00	37°

The accompanying graph shows the bearing which temperature has upon milk-yield. It will be observed that the three hottest months of the year are December, January, and February. The herd reached its maximum yield during December. From then onwards, throughout the months of January and February, as the effect of the temperature was felt upon the growth of the grass and the animals, the yield of milk rapidly decreased. With the cooler month of March a lessened decrease in quantity of butterfat was observed.



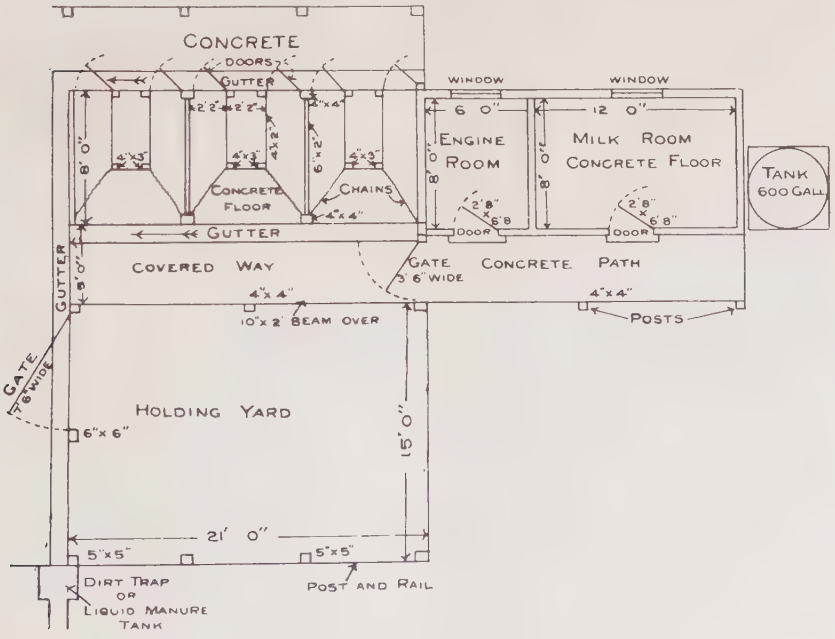
GRAPH SHOWING RELATION OF TEMPERATURE TO MILK-YIELD AT GALLOWAY FARM, 1925–26.

The two most critical months of the year at Galloway normally are January and February. During that period the pastures do not yield a succulent growth, and consequently, if no supplementary crops such as millet or oats are grown to provide feed, a rapid drop can be looked for in the yield of the herd. As a general rule, therefore, where dairying is being carried out in Central Otago the provision of a summer supplementary crop should be regarded as sound practice. The possibility of successfully grazing lucerne during these two months has not as yet been fully investigated, but dairy-farmers as a whole feel diffident (not without cause) of putting their cows on lucerne, in view of the danger of bloating.

Further reference to the graph will show that the cows are inclined to be late in realizing their peak of production. If possible, the peak should be brought forward to November. This will mean calving a month earlier than has been our custom, and in such a case provision for early spring feed is necessary. It is to be remembered that the spring growth here does not take place until September, and if the cows calve in August no grass is available for grazing. The practice at Galloway has been the sowing of Emerald rye-corn in the autumn. This crop grows satisfactorily throughout the winter months, and by the middle of August provides succulent grazing.

THE MILKING PLANT.

The facilities for milking at Galloway are modelled on the most up-to-date methods combined with moderate cost of installation. The milking-shed proper is of the walk-through type, with accommodation for eight cows, four being milked while the other four are being stripped. The bails are fitted with thigh-chains. The walk-through doors are of a very simple and efficient type, operated by means of a simple hand-operated lever. The precincts of the milking-shed, engine-room, and vat and separator room are concreted, this keeping the place clean, wholesome, and free from offensive odours, and also facilitating the hosing-down and sweeping-away of manure. Ample drainage provision has been made to take away all surface water with its obnoxious contents. The engine-room is compact, well equipped, and contains a 3-horse-power oil-engine with the necessary shafting, driving-gear, and rotary air-pump. The milking-machine



PLAN OF MILKING-SHED, ETC., AT GALLOWAY FARM.

plant is of the releaser type, and has proved very satisfactory. The separator and releaser room is fitted with a 50-gallon receiving-vat, and also contains a testing-machine and necessary equipment. The washing-up trough is situated outside the milk-room on the veranda, hot water being abundantly supplied by a twin circulator and a water-heater. An abundant service of hot water is available at all times. The milking-shed has been in operation for two seasons, and experience has shown that the plant as a whole is excellently suited to the conditions existing in Central Otago.

PASTURES AND LUCERNE.

As will be the case on any dairy farm in Central Otago, the two chief crops are, firstly, irrigated grass, and, secondly, irrigated lucerne. Where one can successfully grow these two crops there should be little need to fear that dairying cannot be carried out with success. As has already been pointed out, additional crops for the provision of early spring and early summer feed are to be recommended, but with good stands of lucerne the dairy-farmer has ample provision for his winter-feed requirements, and need not unduly worry about the provision of roots for the winter months. The Galloway farm pastures are of a permanent nature, being chiefly composed of perennial rye-grass and white clover. These two types of pasture plants thrive remarkably well, and should certainly be dominant in the seed mixtures used in establishing pastures on irrigated country. Very little cured hay or green lucerne is used for feeding cattle or sheep during the summer months, as the farmer looks for grass pastures to supply the bulk of the summer feed. The average irrigation farmer usually keeps a small flock of sheep in addition to his dairy cows and horses, and where such is the case good irrigated pastures are essential.

Central Otago is well adapted to the growing of pasture grasses and clovers, for, with a good supply of water, coupled with a soil low in lime-requirement and the presence of almost continuous sunshine, conditions are ideal. In laying down the pastures at Galloway the aim has been to obtain a judicious mixture of grass and clovers in such a proportion as to produce a palatable sole with a high feeding-value. It is recognized that there is no single species having all the characteristics that are looked for in an irrigated pasture. A mixture of several varieties of grasses and clovers is usually desirable. The different grasses have varying times of maximum growth, and since with the aid of water the pasture can be maintained in good growing-condition throughout the entire irrigation season it is quite necessary that a mixture should be sown containing some early, medium, and late growing varieties.

The main grass-seed mixture used on the farm is composed of 16 lb. perennial rye-grass, 6 lb. cocksfoot, 4 lb. timothy, 1 lb. Poa pratensis, 2 lb. alsike clover, and 1 lb. white clover—a total of 31 lb. per acre. On the steeper hilly faces which were cultivated with the disk and tine harrows alone a simpler mixture was sown, this being made up of 16 lb. perennial rye-grass, 6 lb. cocksfoot, 2 lb. alsike, and 1 lb. white clover—a total of 25 lb. per acre.

Full particulars of the method of sowing the pastures and their subsequent irrigation and utilization were given in this *Journal* for

FIG. 3. PART OF THE DAIRY HERD AT GALLOWAY FARM.

FIG. 4. THE DAIRY PREMISES.

Milking-shed of walk-through type; separator and testing room, and engine-room, attached.

FIG. 5. OVERSEER'S COTTAGE, AND (ON LEFT) STABLE AND IMPLEMENT-SHED.

Note good winter condition of dairy stock seen in foreground, due to feeding of lucerne hay and ensilage.

February, 1925, and embodied in Bulletin No. 120, "Irrigation." The carrying-capacity of irrigated pastures is undoubtedly very high. The total grazing-stock carried at Galloway during the past season was fifty-seven head, or one animal to 1·5 acres. When the farm is fully stocked it is anticipated that fifty head of milking-cows, ten young cattle, and six other animals can be successfully carried on the 89 acres of irrigated land without recourse to buying feed. If this is realized, then the carrying-capacity will be one head to 1·3 acres—a very creditable performance, and one which will speak highly of the capabilities of Central Otago.

An area of 18 acres is devoted to the growing of lucerne, one field being irrigated by the border and the other by the contour method. Lucerne, as has already been stated, thrives excellently in Central Otago, and on the Galloway farm very good yields are obtained. Two main types of soil are utilized in the growing of lucerne, one a gravelly river-bed soil and the other a deep clay loam. As might be expected, the yields per acre are higher on the heavy soil than on the lighter, the loam field yielding 5 tons of cured hay per acre, against 4½ tons from the gravelly soil. Weed invasion is guarded against by frequent cultivation of the crop by spring-tooth harrows or a grubber. The cost of labour for harvesting in Central Otago is high, and the cost of conserving lucerne hay when horse-drays are used is in the vicinity of £1 5s. per ton. Much can be done in the way of investigating cheaper methods of hay-conservation, and it is intended during the present season to deal with this aspect of the matter. Full particulars of the method of sowing and irrigating lucerne as practised at Galloway were given in the *Journal* for December, 1924, and included in Bulletin 120.

LUCERNE ENSILAGE.

During the past season the conversion of lucerne into ensilage was undertaken with a view to ascertaining the cost and to find out the value of the ensilage as winter and early spring supplementary fodder. The silo constructed was of the hillside type. A suitable sloping bank existed on the farm in close proximity to the lucerne-field and in a handy position for feeding ensilage out to stock. This bank, furthermore, had a natural washout caused by a breakaway in one of the irrigation ditches in days gone by. This saved a considerable amount of digging out that would otherwise have been required, and the pit location was accordingly an ideal one. When the material was dug out it was utilized to build up a road through a low part of the farm; thus two permanent improvements were effected at the same time. The cost of constructing the pit was: Labour, £28 10s.; timber, £19; concrete, £1 13s.: total, £49 3s.

The ensilage was made from the second cut of lucerne, at a cost of £17 2s. for labour, horses, meals, &c. Taking the interest and depreciation on the silage-pit at £5 10s., the total cost was £22 12s. The weight of silage in the pit came to approximately 50 tons, the cost thus being just over 9s. per ton. This cost appears to be reasonable, particularly when it is borne in mind that high labour rates prevail throughout the district. Although the silage when opened up was not of the best quality, evidently having been allowed to over-

heat, it was relished by the stock and little wastage resulted. The difficulty of getting the first cut of lucerne into stack in Central Otago would apparently warrant its conversion into ensilage. Often on the farms of this district a large surplus of grass is obtained which cannot be controlled by stock. The utilization of this grass by making it into ensilage would undoubtedly be a step in the right direction, and when so conserved the material should prove a valuable asset to the dairy-farmer or sheep-farmer during the winter months.

In recording the farm operations special mention must be made of Mr. W. Faithful, the Overseer, whose untiring energy and interest in the welfare of the farm have largely brought it to its present state of productivity.

(To be continued.)

POSITION OF THE CATTLE-TICK.

THE annual report of the Live-stock Division for 1925–26 states: "Although the cattle-tick does not show any diminution within the A area, it does not show any tendency to spread within the area known as B, and may actually be said to have decreased or almost disappeared from some districts where it was previously found. This satisfactory position indicates that the policy of spraying cattle or otherwise destroying the ticks when they first make their appearance is a good one. In Waitara district the quarantine area had to be enlarged owing to some ticks having been found on a farm immediately outside the original area. Within the area quarantined a few ticks were found during the season, but the prospects for complete eradication are hopeful. During the year a dip was erected by the Department at Mohakatino, near the northern boundary of Taranaki, and all cattle proceeding south are required to be dipped. A dip has also been erected at Waitara by the combined efforts of the settlers concerned, and all cattle leaving the quarantined area are dipped, and all other possible precautions have been taken to prevent the spread of the tick."

In some general remarks on this subject in his annual report for the same period the Director-General of Agriculture states: "The ticks found on cattle and other animals in the northern part of the Dominion have continued to be harmless so far as any ill effect upon the health of the animals is concerned. A systematic series of experiments which, after several failures to get them started owing to the ticks supplied dying, have been carried out at the Queensland Government's laboratory, at Townsville, indicate that these ticks — unlike the so-called 'Queensland tick' — are incapable of transmitting tick-fever from animal to animal. As these ticks progress southwards in the Dominion they seem to find it increasingly difficult to establish themselves, especially when away from the coastal areas, and a number of farms where they at one time appeared in small numbers are now quite clear of them. They damage hides when present in sufficient number, and this point needs special attention, and in itself warrants farmers doing all that is possible to eradicate them."

Export of Stud Stock.—The numbers of stud stock exported from New Zealand during the year 1925–26 were: Sheep, 2,692; cattle, 130; pigs, 10. Of the sheep exported, 353 were for the Falkland Islands, this being indirectly the result of the Government having loaned to the Falkland Islands Administration the services of Mr. H. Murro, of the Department of Agriculture, to report on the position of the sheep industry there.

Cidermaking.—It is estimated that in the year ended 31st March, 1926, some 50,000 gallons of cider, valued at approximately £12,500, were produced in the Dominion.

THE GRASSLANDS OF NEW ZEALAND.

SERIES II. NORTH ISLAND HILL COUNTRY.

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GRASSES AND CLOVERS FOR HILL COUNTRY.

(4.) Crested Dogstail (*Cynosurus cristatus*).

CRESTED DOGSTAIL is commonly widespread on hill country, but it does not occupy the same general position as does Poa pratensis. In the writer's opinion this is largely due to the fact that crested dogstail has not been sown nearly so generally on the original primary-forest burns as has Poa pratensis. Again, crested dogstail, being a tufted or diminutive tussock-forming grass (Fig. 83), has not nearly the staying-powers under difficult situations that a grass like Poa pratensis has with its creeping underground-stem system.

Crested dogstail ranks in fertility-requirement with Poa pratensis and cocksfoot. These three species make up a fairly definite group—below perennial rye-grass in fertility-requirement on the one hand, and just above the brown-top standard of soil-fertility on the other hand.

Crested dogstail prefers rather moist soil conditions, and thrives best on somewhat consolidated soils, being in this respect somewhat similar to rye-grass. It will not endure shade, and is most readily smothered out by rank growth of cocksfoot, &c. (Fig. 84), or by any form of secondary growth. This inability to withstand the smother of rank cocksfoot probably largely accounts for the paucity of crested dogstail existing on much of the hill country grassed years ago, the practice of spelling the burn and harvesting cocksfoot-seed being decidedly inimical to the persistence of crested dogstail. Ranking as this grass does in fertility-requirement with cocksfoot, the places it would thrive best in and where it would be seen in its true form are where the soil conditions favour a strong growth of cocksfoot. As before stated, a rank growth of cocksfoot is fatal to crested dogstail. Those areas, therefore, that were spelled for seed-production in the early days, or which got away rank and which now are cleaned up and are under ordinary grazing-conditions, are liable to contain practically no crested dogstail in the sward to-day.

In the past crested dogstail has not been a very popular grass with many farmers, and its unpopularity may be largely attributed to its tendency in the first year or two to bolt away rapidly to seed in the early summer, and during its seeding-period to fall away almost entirely so far as the production of leaf is concerned. Very few farmers can recognize crested dogstail in the vegetative stages. When in seed most can recognize it, but when shown the plant in the vegetative stage the majority mistake it for perennial rye-grass. This fact, together with the tendency of the grass to bolt away to seed as mentioned, is largely responsible for its unpopularity.

Crested dogstail is essentially a winter and early spring producing grass, and during those periods it may even surpass rye-grass in production, particularly so on soils not quite good enough for

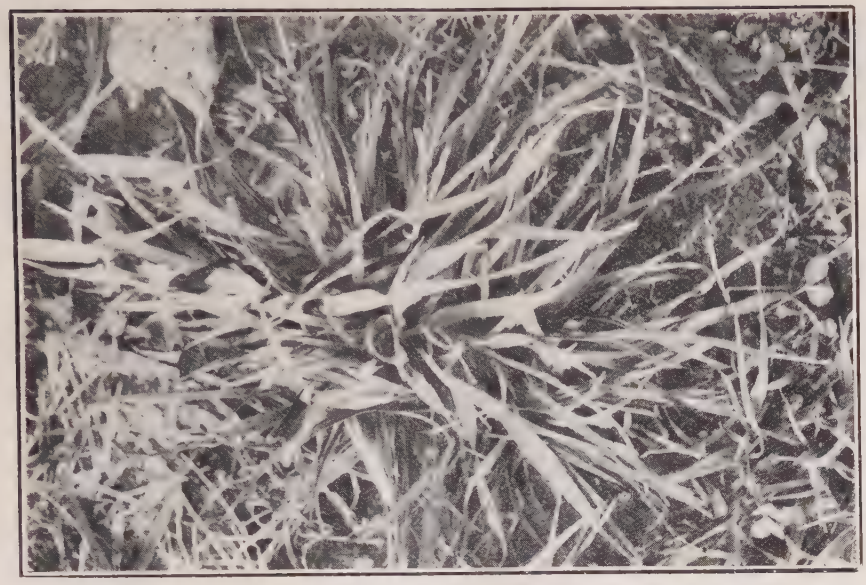

FIG. 83. GROWTH-FORM OF CRESTED DOGSTAIL.

A tufted, diminutive tussock-forming grass whose crown is slightly below ground. Owing to this growth-form, dogstail is unable to spread vegetatively as does Poa pratensis.

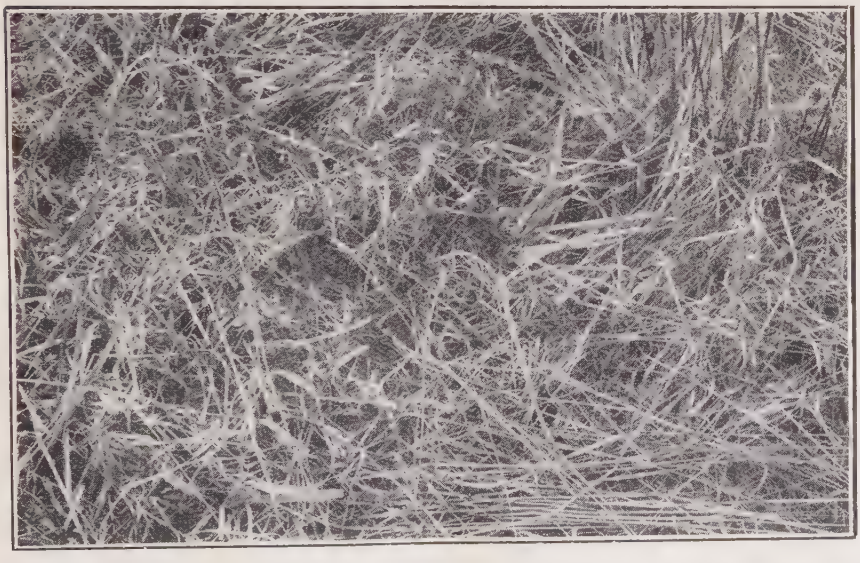

FIG. 84. CRESTED DOGSTAIL KILLED OUT IN ONE SEASON BY RANK GROWTH OF COCKSFOOT.

Spelling bush-burns for cocksfoot-seed production—so common in the early days—must have considerably reduced the amount of crested dogstail that had become established in those pastures. The long stalks shown in foreground of photo are crested dogstail; the plants that produced them were quite dead when photo was taken. [*Photos by E. Bruce Levy.*

rye-grass (Fig. 85). In the summer-time it runs rapidly to seed and growth, then ceases until the early autumn rains. After the second year of sowing, although numerous crested-dogstail plants persist in the sward, there is never the same tendency for a large production of seed-heads. This, again, is inclined to give farmers the impression that crested dogstail has largely gone from the pasture sward. Nevertheless, when crested dogstail is present in the pasture, under normal grazing-conditions some seed-heads are put up each year, and, owing to the harshness of these heads, they are not eaten by stock, and ripe seed is produced annually in the pasture.

This free-seeding attribute of crested dogstail is of importance, particularly so when one bears in mind the ease with which the grass re-establishes itself from seed even under rather adverse seed-bed conditions. Many farmers have included only ½ lb. of crested dogstail per acre in their mixtures, and in a few years the pasture has run predominately to numerous small, rather stunted plants of crested dogstail (Fig. 86). Such re-establishment is possible only when the conditions in the pasture are such that there has set in a dwindling of the rye-grass and cocksfoot, with a corresponding opening-up of the sward. As before stated, crested dogstail is a free seeder, and in such a weakened, open turf the seed shed readily germinates and establishes, and at times so thick is the take that the very crested-dogstail plants themselves choke one another out.

The point the writer wishes to impress here, however, is that when crested dogstail is increasing from reseeding in a mixed pasture sward it is an almost certain indication that the pasture sward on the whole is weakening and opening up as a result of a decrease in soil-fertility. At the Winton Experimental Area, on which photo of Fig. 85 was taken, 3 lb. of crested dogstail was included in the mixture sown. During the five years that this pasture has been down, the sward has been systematically top-dressed and a very good sole of grass maintained. To this day there has been no increase in the number of crested-dogstail plants present in that pasture, and it may be repeated again that should an increase take place it will be a certain indication that the associate grasses and clovers are weakening, and that the pasture is opening up in consequence. Had crested dogstail not reseeded and re-established in the weak pasture referred to previously it is almost certain that the incoming of such plants as sweet vernal, Yorkshire fog, and brown-top would have been more rapid.

The position crested dogstail occupies on the hill country where it has been sown, and where the pastures have been grazed fairly short since the primary-burn days, is not particularly easy to define. As in the case of Poa pratensis, no large areas of crested-dogstail-dominant pasture are met with. The plant is confined really to the better slopes and foothills, and more particularly on the wetter portions rather than on the drier areas. The plant really will endure wetter conditions than rye-grass, cocksfoot, and Poa pratensis. In general, however, it functions extremely well as an associate species to the three grasses mentioned, particularly in regard to filling up the bottom of cocksfoot pastures where the conditions are not entirely suitable for perennial rye-grass. This attribute of crested dogstail—that is, being a good bottom grass on soils just a little too poor for perennial rye-grass—makes dogstail of

FIG. 85. CRESTED DOGSTAIL MAKING GOOD WINTER GROWTH.

The four rather tussocky clumps are plants of crested dogstail, which are seen overtopping rye-grass and cocksfoot in this sward. Photo was taken in Southland in middle of winter. This pasture is now five years old, and under high-fertility maintenance no increase in the number of crested-dogstail plants has taken place. (Compare with Fig. 86.)

FIG. 86. TURF ON THE SAME TYPE OF COUNTRY AS FIG. 85.

Here the rye-grass has largely gone out, and the bottom of the pasture has filled up between the cocksfoot-plants with innumerable small crested-dogstail plants that have become established there by reseeding. Germination has been induced through opening up of the turf caused by dwindling of rye-grass, &c.

[*Photos by E. Bruce Levy.*

very great value on the better class of hill country. The grass is early to come away in the spring, and this, again, coupled with the high palatability of the leafy foliage, makes it a highly desirable constituent of any pasture, particularly in regard to pastoral lands. One of the finest sights is to see sheep grazing on rolling hill-country pasture which contains a good proportion of crested dogstail. It is this grass that really gives that rich dark-green appearance to such pastures in the early spring.

It is, however, only on the more fertile aspects of hill country in general that crested dogstail presents this early spring feed and adds so to the attractive appearance and grazing-value of the pasture at that period (Fig. 87). Just as in the case of Poa pratensis, cocksfoot,

FIG. 87. FOOTHILLS AND EASIER ROLLING COUNTRY IDEAL FOR CRESTED DOGSTAIL.

Mr. Burridge, Moawhango, from whose farm the photo was taken, was particularly struck with the early feed produced, and with the way sheep stuck to the lower slopes of this country in the early spring. Crested dogstail was doing excellently on the slopes. *[Photo by E. Bruce Levy.*

and rye-grass, so does crested dogstail decline as the soil-fertility becomes reduced. The reseeding and re-establishment phase is really the beginning-of-the-end phase of crested dogstail so far as high production is concerned. Unless fertility is in some way increased these seedlings soon present a yellowish appearance, and many do not develop much beyond the seedling stage. Those that do survive remain as small, stunted plants, and the original old plants decline greatly in size. No more tillers from the crown are formed, and the plant persists as a mere vestige of one small shoot which scarcely ever puts up a seed-head. Those plants that do manage to seed generally die right out after the seed ripens. Under the poor conditions now existing in such a pasture, re-establishment from any seed shed is practically impossible, and crested dogstail may finally die right out of the pasture, except

in a few more favoured spots where fertility is not so depleted. This, together with rank smother conditions that may have occurred in the pasture's history, probably accounts more or less for the often rather erratic distribution of crested dogstail over any hill-country area.

It may be said in regard to the deterioration of grazed pastures that if crested dogstail is running out as a result of fertility depletion there is no hope for rye-grass, cocksfoot, or Poa pratensis remaining as high producers on that area. Crested dogstail really is about the last of these four to go. All will persist for years as vestiges in the pasture, but dominance will have changed in favour of one of the inferior grasses brown-top, danthonia, or ratstail—or of certain weeds such as catsear, hawkweed, rib-grass, cudweed, &c., or of secondary growth.

POSITION OF CRESTED DOGSTAIL SUMMARIZED.

Summing up the position occupied by crested dogstail at the present time, one finds that it is essentially a bottom grass that can be readily smothered out of a pasture by rank growth of cocksfoot, &c. It thrives best on a moderately fertile soil, fitting admirably in this respect as an associate species with cocksfoot and Poa pratensis. Consolidated conditions rather than loose soil conditions, and wet soils rather than dry soils, favour the persistence and spread of this grass. Spread of crested dogstail is brought about entirely by seed, the plant being tufted, with no means of lateral vegetative spread. The free-seeding attribute of the grass, together with the ease with which the seeds germinate and establish even under rather hard conditions, make for temporary dominance of this grass during that period between the weakening and running-out of rye-grass on the one hand, and the coming-in of sweet vernal, Yorkshire fog, and brown-top on the other hand. The better slopes of the hill country where there still persists a certain amount of perennial rye-grass, cocksfoot, Poa pratensis, and white clover are the most favoured situations for crested dogstail. It will persist as vestiges for many years in weak, open turf, or with a brown-top or danthonia dominant pasture; but, as one would expect, the yield from crested dogstail falls to practically nothing within a danthonia turf, particularly so on the drier aspects.

As before mentioned, crested dogstail will not endure shade, and therefore as a grass to use in the combating of secondary growth it is of practically no value once such growth becomes dominant on the area.

CRESTED DOGSTAIL IN PRIMARY AND SECONDARY BURNS.

The writer is of opinion that not enough crested-dogstail seed has been included in mixtures, either for primary or secondary burns. The ease with which this grass establishes, even on the poorer aspects of the burn, and the comparatively rapid growth made by the young plants, together with the ability of the grass to persist on the country even after the disappearance of perennial rye-grass, coupled with its high palatability, make crested dogstail one of the most desirable for all hill-country sowings. An amount of 3 lb. to 4 lb. per acre should be included in the mixture.

As far as the secondary burn is concerned, we are finding in our experimental work at Whangamomona that crested dogstail is one of the best and cheapest seeds to use, and for the last two seasons this grass, together with brown-top, has been the base of all sowings on secondary burns. The great ease with which the plant establishes from seed, and the fact that it lasts longer than rye-grass on these hard faces, incline us more and more to use this seed in preference to perennial rye-grass. On the harder slopes and knolls the grass, of course, will not yield at all highly. It establishes there quite well, but seldoms tillers out, and remains as a weak, stunted plant of one shoot. On the rather better slopes and aspects, however, the plant tillers well, and soon produces quite a nice bite for sheep. In this respect it is, of course, not quite so rapid as rye-grass, provided conditions are good enough for the latter, but its establishment is more certain under the average conditions existing on the secondary burn. An amount of 3 lb. to 4 lb. of crested dogstail per acre should also be included in all secondary-burn mixtures.

The seed of crested dogstail at the present time is expensive, being in the neighbourhood of 2s. per pound. At this price, of course, the inclusion of 4 lb. in the mixture adds considerably to the price of the latter, but the writer feels that under the conditions stated 6s. to 8s. spent on crested dogstail will pay better than the same amount spent on any other seed, with perhaps the exception of brown-top and white clover. Owing to the fact that crested dogstail is proving one of the best grasses for hill-country sowing, the considerable rise in price of the seed from 10½d. per pound in 1924 to 2s. per pound in 1926 is much to be deplored, both from the merchant's and the sower's point of view. Hill-country mixtures must be kept cheap, and it simply means that when seed is at a high price less of that seed is sown in any one mixture, satisfactory results from the smaller sowings are not secured, and the farmer is apt to give up the sowing of his secondary burns altogether, trusting to luck that a little suckling-clover, Yorkshire fog, sweet vernal, &c., will spring up naturally after the burn and give a certain amount of feed—until these grasses are again smothered out by the return of the secondary growth. At the present time, according to Mr. N. R. Foy, Seed Analyst (Biological Laboratory), the present high price of crested dogstail is due to a world shortage of this seed owing to the failure of last season's crops. The normal price of crested dogstail varies from 1s. to 1s. 3d. per pound.

Crested dogstail, apart from the feed it produces (thus enticing stock to work on the area), is of no value in the prevention and control of secondary growth. As soon as the crown becomes shaded by any type of growth the plants may die out completely within one season. This fact certainly does limit the usefulness of crested dogstail in situations where the secondary growth may come back and may have to be burnt several times before it is finally overcome. With crested dogstail it is a matter of sowing more seed each time the secondary growth is burnt off, whereas with Poa pratensis and certain other species the reseeding of the burn once these plants are established on the area may not be necessary.

MAINTENANCE OF SOIL-FERTILITY.

With regard to both crested dogstail and Poa pratensis, one must again emphasize the prime importance of maintaining moderately fertile soil conditions. These grasses will yield well, and are excellent bottom grasses for all types of hill country where fertility can be built up and maintained. Once, however, the soil-fertility falls, so that brown-top, danthonia, ratstail, &c., gain in the pasture, little growth can be expected from either of these two species. As with cocksfoot, so with crested dogstail and Poa pratensis, the vestiges of these species are still plainly discernible in most of the worn-out and deteriorated grass swards, It is not too late at this stage to apply manure to those plants to enable them to come back to their former state of production.

(Series to be continued.)

CONTAGIOUS ABORTION AND STERILITY IN COWS.

THE annual report of the Live-stock Division for 1925–26 remarks on the subject of contagious abortion and sterility in dairy herds as follows :—

These troubles are still responsible for a considerable loss to dairymen, although in the case of contagious abortion most districts report a marked decrease of actual abortions as having occurred. This is probably the effect of acquired immunity, which is a particular feature of the disease. In the case of sterility, however, the trouble is still prevalent, and has been more or less general. It is a problem calling for close investigation in field and laboratory, and during the year a large amount of special investigational work has taken place. This is being continued, and it is hoped that with closer study of the various genital affections now existing among the cows some solution of the problem will result. A number of veterinary officers have been concentrating on this disease in association with the Wallaceville Laboratory staff. Officers have also been giving lectures throughout the dairying districts with a view to assisting farmers to deal with these troubles to the best advantage with the knowledge already gained. The work done on sterility at Wallaceville during the year has been mostly in continued observation of herds known to be affected with abortion, granular vaginitis, or temporary sterility ; in watching the result of herds feeding on calcium phosphate ; and in the use of vaccines, both live and dead. This latter has been carried out only on a very small scale, because of the necessity for suitable conditions in the herbs used. An experiment is in course of construction at the Laboratory to see (1) whether it is possible to build up an absolutely free herd from the affected herd ; (2) whether abortion-free herds have the same amount of temporary sterility as affected herds.

THE WILD PIG NUISANCE.

THE Departments of Agriculture, Lands, and the Forest Service again assisted to alleviate the wild pig nuisance in certain parts of the North Island. Up to the 30th November, 1925, the Forest Service, in its capacity as organizing and controlling agent, collected and paid out the bonus upon 17,227 wild pig snouts in the Wellington conservation region. Arrangements have been made whereby all persons who presented wild pig snouts for counting and payment before the 30th November, 1925, but after the exhaustion of the appropriation, will be paid the bonus during the current financial year. During the latter part of the period under review the system of granting a bonus for the destruction of wild pigs was extended to cover a portion of the Opotiki County, with the result that 2,026 wild pig snouts were destroyed in that district. The payment of the bounty has been responsible for the total destruction of 19,253 wild pigs in the aforementioned infested areas. For the current year the Departments of Agriculture, Lands, and the Forest Service have again joined financial forces to continue operations for the destruction of wild pigs in the North Wellington, Taranaki, and Opotiki districts.—*Annual Report of State Forest Service, 1925-26.*

RAPE MANURIAL EXPERIMENTS IN CANTERBURY, SEASON 1925–26.

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A FURTHER trial of the manures used for the rape manurial experiments in the preceding season (see *Journal*, November, 1925) was made in 1925–26 on the farms of Mr. J. Symes, Darfield, and Mr. R. S. Gunn, Racecourse Hill. Other quantities of the manures, details of which are given below, were also tried. A third experiment, involving method of sowing, was also carried out on Mr. W. W. Mulholland's farm, at Darfield: this is discussed separately. The experiments are designated "A" (Mr. Symes's farm), "B" (Mr. Gunn's), and "C" (Mr. Mulholland's).

Experiments A and B.

The treatments applied on A and B were as follows:—

(1.) Superphosphate 42/44 per cent., 1 cwt. per acre.
(2.) Ephos phosphate, 1 cwt. per acre.
(3.) Super ½ cwt. plus Ephos ½ cwt. = 1 cwt. per acre.
(4.) Super 1 cwt. plus dried blood 1 cwt. = 2 cwt. per acre.
(5.) Super, 2 cwt. per acre.
(6.) Super 1 cwt. plus Ephos 1 cwt. = 2 cwt. per acre.

Manures used in season 1924–25. The quantity per acre was reduced by ½ cwt. in the 1925–26 season.

Ten replications of the above series were sown in each case.

Super at 2 cwt. per acre was also tried, two applications of 1 cwt. each being made. The first application was made by running the drill over the plots with the coulters merely scratching the surface; the second application was applied immediately afterwards with the seed, as for the other plots. The object of this method of application was to supply the additional phosphate without the whole of it being in contact with the seed. The extra passage of horses and drill over these plots appears to have introduced a disturbing factor, and the germinations and yields are not discussed here.

In Experiments A and B the seed was sown through every coulter of the drill, giving 7 in. row spacing. Date sown: Experiment A, 21/10/25; Experiment B, 1/12/25. Seeding: 3 lb. per acre. Previous crops: Experiment A, 1924–25, turnips; 1921–24, grass. Experiment B, 1924–25, turnips; 1923–24 and 1922–23, wheat, preceded by grass.

RELATIVE EFFECTS OF MANURES ON GERMINATION.

Germination counts were made as described in the *Journal* for July last, p. 11, and the results of these are shown in Table 1.

Comments on Table 1.

Experiment A: Dry conditions at the time of sowing and for some time afterwards were experienced. The behaviour of Ephos as compared with super 1 cwt. per acre is difficult of interpretation. It is possible that the small quantity of super provided a certain stimulus

Table 1.—Relative Germination on Plots of Experiments A and B.

Treatment per Acre.	Experiment A. Counts taken 41 Days after Sowing.			Experiment B. Counts taken 38 Days after Sowing.	
	Number of Plants per 10 ft.*	Difference from Super 1 cwt. Plots.	Odds.	Number of Plants per 10 ft.*	Difference from Super 1 cwt. Plots.
Super 1 cwt.	28·6	..	..	23·2	None of the differences significant.
Ephos 1 cwt.	20·3	— 8·3	>24000	23·4	
Super ½ cwt. plus Ephos ½ cwt. ..	27·3	*— 1·3*	..	25·5	
Super 1 cwt. plus blood 1 cwt. ..	15·4	—13·2	>24000	21·3	
Super 2 cwt.	17·5	—11·1	>24000	23·0	
Super 1 cwt. plus Ephos 1 cwt. ..	23·6	— 5·0	140	23·0	

* Mean of forty counts; the same coulter row was taken in each case. > = greater than (all tables).

NOTE.—Differences which have odds of less than 30 to 1 in their favour, and are therefore not statistically significant, are shown in italics. This applies to all tables.

which under dry conditions is lacking in the case of the less soluble Ephos. Only one control plot was sown, so this supposition could not be checked. It will be noticed that the larger quantity of super (2 cwt. per acre) has caused a definite depression, there being only about two-thirds the number of plants as compared with super 1 cwt. The addition of dried blood to super has reduced the number of plants by nearly 50 per cent. This action of blood on cruciferous seeds has been fairly consistent in these and other Canterbury experiments. Super plus Ephos at 2 cwt. per acre shows a slight depression in germination.

Experiment B: The plots of this experiment were sown as soon as the condition of the soil would permit after about ½ in. of rain had fallen. None of the plots differs to a significant degree from super 1 cwt. in germination effect. Super and blood again shows a tendency to a reduced germination, but the chances were only 13 to 1 in favour of significance.

YIELDS.

Experience of the previous season indicated that the growth of rape on Ephos-treated plots was rather prolonged as compared with that on those receiving super. It was decided, therefore, that portion of the whole of the plots would be cut and compared when the earlier-ripening ones were at the ideal stage for feeding off, and further cutting done when the later-maturing ones were ripe. The order of ripening was not the same as in the previous season. In Experiment A the Ephos plots were a little later in maturing than was the super 1 cwt. plot, but the more heavily treated phosphate plots hung out longer than any.

In Experiment B the Ephos plots ripened first, and at the time of the first cut were at an ideal feeding stage. The heavily phosphated plots again showed later ripening. Just after the first weighings were made a heavy rain fell, with the result that all plots became considerably greener again, and at the time of the second weighings, a fortnight after the first, they were all at about the same stage.

Table 2.—Yield Results, Experiment A.

Area of individual weighed plot, $\frac{1}{455}$ acre.

Treatment.	First Weighing, 8/1/26, 11 Weeks 2 Days after Sowing.				Second Weighing, 22/1/26, 13 Weeks 2 Days after Sowing.			
	Number of Paired Plots.	Yield per Acre.	Increase (+) or Decrease (−) as compared with Super 1 cwt.	Odds.	Number of Paired Plots.	Yield per Acre.	Increase (+) or Decrease (−) as compared with Super 1 cwt.	Odds.
		Tons.	Tons.			Tons.	Tons.	
Super 1 cwt. ..	20	4·44	..	..	15	4·01	..	..
Ephos 1 cwt. ..	20	4·00	−0·44	>9999	15	3·57	−0·44	9999
Super ½ cwt. plus Ephos ½ cwt.	20	4·34	−0·10	10	15	3·97	−0·04	2
Super 1 cwt. plus dried blood 1 cwt.	20	4·49	+0·05	2	14*	4·00	+0·05	2
Super 2 cwt. ..	20	4·38	−0·06	3	15	3·99	−0·02	2
Super 1 cwt. ..	18	4·54	..	..	15	..	..	..
Super 1 cwt. plus Ephos 1 cwt.	18	4·74	+0·20	11	15	4·43	+0·42	140

* Mean of fourteen super plots with which super-plus-blood plots were compared, 3·95 tons per acre.

Comments on Table 2.

In the first weighing only the yield of the Ephos plots showed any significant difference from that of the super plots. The lower yields of the second weighing as compared with the first do not necessarily

TYPICAL PORTION OF PLOTS IN A POOR CROP (EXPERIMENT A).

To the right of the poles is an unsown strip with a control (unmanured) plot between it and the first cut plot.

[*Photo by A. W. Hudson.*

mean a definite reduction in yield due to overripening. The yields in the first weighing are computed from twenty determinations; those of the second from fifteen. The relationship of all is much the same in both cases, however. Here, again, super 1 cwt. is superior to Ephos. The 2-cwt.-per-acre application of super and Ephos is slightly superior to super 1 cwt., although in the first weighings the odds are not sufficiently great to enable the difference to be regarded with certainty.

Table 3.—Yield Results, Experiment B.

Area of individual weighed plot, $\frac{1}{453}$ acre

Treatment.	First Weighing, 10/2/26, 10 Weeks 1 Day after Sowing.				Second Weighing, 23/2/26, 12 Weeks after Sowing.			
	Number of Paired Plots.	Yield per Acre.	Increase (+) or Decrease (−) as compared with Super 1 cwt.	Odds.	Number of Paired Plots.	Yield per Acre.	Increase (+) or Decrease (−) as compared with Super 1 cwt.	Odds.
		Tons.	Tons.			Tons.	Tons.	
Super 1 cwt. ..	12	5·05	..	..	10	5·57	..	..
Ephos 1 cwt. ..	12	3·94	−1·11	>9999	10	4·90	−0·67	1700
Super 1 cwt. plus blood 1 cwt.	12	6·32	+1·27	>9999	10	6·44	+0·87	>9999
Super 2 cwt. ..	12	6·93	+1·88	>9999	10	6·81	+1·24	>9999
Super 1 cwt. plus Ephos 1 cwt.	12	6·71	+1·66	>9999	10	6·89	+1·32	>9999
Super 1 cwt. ..	20	5·13	..	..	10	..	..	..
Super ½ cwt. plus Ephos ½ cwt.	20	4·79	−0·34	150	10	5·57	..	..

Comments on Table 3.

In both weighings the superiority of super over Ephos is considerable, being over 1 ton in the first and $\frac{2}{3}$ ton in the second. Super plus blood, super 2 cwt., and super 1 cwt. plus Ephos 1 cwt. show decided increases over super 1 cwt. in both crops. The mixture of super and Ephos sown at the rate of 1 cwt. per acre is not as good as super 1 cwt. on the first weighing, but caught up to and equalled the super at the time of the second weighing.

Experiment C.

Date sown: 30/10/25. Seeding: 1¾ lb. per acre. Previous crop: Grass for three years. In this experiment the seed was sown in 14 in. rows—that is, through alternate coulters of the drill.

RELATIVE EFFECT OF MANURES ON GERMINATION.

The manures in some cases were sown in the seed rows only. In others they were sown through every coulter, so that half the manure fell on the seed rows and half between them. It was expected that with heavier sowings of superphosphate — say, 2 cwt. per acre — where the whole of the manure fell with the seed, considerable adverse effect on germination would result. The question was whether the manure could be better utilized by sowing through every coulter, in which case there would be less harm to the seed, and every chance of the established plants getting the benefit of the manure between

the rows as soon as their rooting-system was developed. Another form of nitrogenous fertilizer—sulphate of ammonia—was also tried. The results of the preceding season (see *Journal* for November, 1925, p. 308) showed that blood was having a beneficial effect on yield, and the possibility of better results from a more efficient form of nitrogen was considered worth testing. Consequently sulphate of ammonia at the rate of 67 lb. per acre (an amount containing about the same quantity of nitrogen as 1 cwt. of blood) was used.

The manures used and the manner of sowing are as follows:—

Super 1 cwt. per acre; manure in 7 in. rows.
Super 1 cwt. per acre; manure in 14 in. rows.
Super 2 cwt. per acre; manure in 7 in. rows.
Super 2 cwt. per acre; manure in 14 in. rows.
Super 1 cwt. plus dried blood 1 cwt. per acre; manure in 14 in. rows.
Super 1 cwt. plus sulphate of ammonia 67 lb. per acre; manure in 7 in. rows.
Super 1 cwt. plus sulphate of ammonia 67 lb. per acre; manure in 14 in. rows.

Ten replications of the above were sown.

The actual germinations as measured by the number of plants per 10 ft. of row are shown in Table 4.

Table 4.—Relative Germination on Plots of Experiment C.

Counts taken 33 days after sowing.

Treatment per Acre.	Spacing of Manure Rows.	Number of Plants per 10 ft.*	Difference in Favour of A.	Odds.
	Inches.			
A. Super 1 cwt.	7	25·8	4·0	35
B. Super 1 cwt.	14	21·8	..	..
A. Super 2 cwt.	7	16·7	6·0	>24000
B. Super 2 cwt.	14	10·7	..	..
A. Super 1 cwt.	14	21·8	8·1	>24000
B. Super 1 cwt. plus dried blood 1 cwt.	14	13·7	..	..
A. Super 1 cwt.	7	25·8	16·3	>24000
B. Super 1 cwt. plus sulphate of ammonia 67 lb.	7	9·5	..	..
A. Super 1 cwt.	14	21·8	18·6	>24000
B. Super 1 cwt. plus sulphate of ammonia 67 lb.	14	3·2	..	..

* Mean of forty counts.

Comments on Table 4.

(*a.*) It is evident from the table that considerable adverse effect on germination has resulted wherever a quantity of super greater than 1 cwt. per acre in rows at 7 in. spacing has been sown. The quantity of 2 cwt. per acre in 14 in. rows has caused a very serious reduction of about 36 per cent. as compared with the same quantity per acre in 7 in. rows. (*b.*) Blood in combination with super has caused a serious reduction as compared with straight-out super. (*c.*) The effect of the addition of sulphate of ammonia to superphosphate has been such

as to indicate that the sowing of the soluble nitrogenous manure with the seed is liable to cause too much damage to germination for it to be practised. In the 14 in. rows the germination was almost entirely ruined.

YIELDS.

At the time of first cutting the plots having the greater number of plants—namely, super 1 cwt. per acre—were somewhat riper than the remainder. The plots receiving nitrogen (blood or sulphate of ammonia) were deeper green in colour than any others, and at the time of the second cutting showed a blue tinge, indicating ripeness.

The results of the weighing are shown in Table 5.

Table 5.—Yield Results, Experiment C.

Number of paired plots from which differences are calculated, 20 in each case. Area of individual weighed plot, $\frac{1}{588}$ acre.

Treatment.	First Weighing, 19/1/26, 11 Weeks 4 Days after Sowing.				Second Weighing, 4/2/26, 13 Weeks 6 Days after Sowing.			
	Spacing of Manure Rows.	Yield per Acre.	Increase (+) or Decrease (−) compared with Super 1 cwt. in 14 in. Rows.	Odds.	Yield per Acre.	Increase (+) or Decrease (−) compared with Super 1 cwt. in 14 in. Rows.	Odds.
	Inches	Tons.	Tons.		Tons.	Tons.	
Super 1 cwt. ..	14	4·01	..	..	4·80	..	..
Super 1 cwt. ..	7	4·27	+0·26	22	4·95	+0·15	9
Super 2 cwt. ..	7	4·56	+0·55	1110	5·24	+0·44	30
Super 2 cwt. ..	14	4·01	..	..	4·69	−0·11	2
Super 1 cwt. plus blood 1 cwt.	14	4·78	+0·77	>9999	5·66	+0·86	>9999
Super 1 cwt. plus sulphate of ammonia 67 lb.	7	3·64	−0·37	46	4·03	−0·77	>9999
Super 1 cwt. plus sulphate of ammonia 67 lb.	14	2·15	−1·86	>9999	2·84	−1·96	>9999

Comments on Table 5.

Comparisons have been made between super 1 cwt. per acre in 14 in. rows and all other treatments, because it is standard practice to sow the whole of the manure in the seed rows irrespective of the width of row. (*a.*) Super 1 cwt., 7 in. rows, *versus* super 1 cwt., 14 in rows: Although a better germination resulted in the case of the former (see Table 4), the increase is not significant in either weighing. (*b.*) Super 2 cwt., 7 in. rows, *versus* super 1 cwt., 14 in. rows: The former shows an average increase over the latter of ½ ton per acre, although having fewer plants. (*c.*) Super 2 cwt., 14 in. rows, *versus* super 1 cwt., 14 in. rows: The reduction in the number of plants (see Table 4) due to the heavier sowing of super has apparently imposed too great a handicap, for, although the 2 cwt. quantity in 7 in. rows is superior to 1 cwt. in 14 in., the 2 cwt. quantity in 14 in. does not differ from the 1 cwt. by a significant amount. (*d.*) Super plus blood *versus* super 1 cwt., 14 in. rows: The reduction in number of plants (see Table 4) caused by the blood has not

prevented it from registering an increase of over ¾ ton in both weighings. (*e.*) The thinning due to the sulphate of ammonia has evidently been so severe as to limit its usefulness, and other methods of application must be tried.

General Conclusions.

(1.) The consistency with which 1 cwt. of super has proved its superiority over 1 cwt. of Ephos as a manure for rape is sufficient evidence for the recommendation of the use of the former. Further trial will be made in the current season, however.

(2.) There is not yet sufficient evidence to warrant the recommendation of the use of more than 1 cwt. of super per acre.

(3.) Nitrogen in the form of dried blood at 1 cwt. per acre added to super has, with the exception of Experiment B above, given decided increases in all experiments to date. Whether the increase caused is commensurate with the cost of the treatment can be decided only when a greater amount of data has been collected and a reliable estimate of the average increase arrived at. The damage to germination and consequent thinning of the crop may be a favourable factor, but it is more probable that the increase is due to the specific action of the blood as a plant-food. Some method of sowing aiming at the reduction of this adverse effect on the seed will be tried in the current season.

(4.) The amount of soil-moisture present is undoubtedly an important factor governing the effect on germination of soluble phosphates.

The Department's indebtedness to Messrs. J. Symes, R. S. Gunn, and W. W. Mulholland for their continued co-operation and interest is here recorded.

VITICULTURE AND WINE-MAKING.

THE annual report of the Horticulture Division for 1925–26 gives the following summarized information regarding the progress of viticulture and wine-making in the Dominion:—

The planting of vineyards, both in table and wine grapes, is steadily increasing. The season of 1925–26 was not favourable to the development of certain varieties of outdoor-grown table grapes, owing to the unsuitable weather conditions prevailing during the setting-period. The prices realized on the markets were, however, satisfactory to growers, especially in regard to the Albany Surprise variety. The crop of wine grapes equalled that of the previous year. In some localities where the weather was hardly warm enough during the ripening-period the sugar content of the grape-juice was low. Generally speaking, the vines were free of disease; this was particularly noticeable in the Hawke's Bay District, which experienced a particularly dry season. The quantity of grape-wine produced in the Dominion was approximately the same as last year—85,000 gallons, valued at £34,000. The co-operative vine-testing plots established in 1922 at Nelson and Te Mata are making satisfactory progress. In connection with the Nelson plot, the results obtained so far indicate the possibility of ripening grapes successfully outdoors in that district. Grape-growing under glass is gradually extending. The high prices ruling for glass and other materials during the past few years practically prohibited the erection of glasshouses. A gradual reduction in prices has, however, enabled development to take place, and several new vineries have recently been built. There is a good demand for hothouse-grown grapes, and the returns to growers have been satisfactory.

TRIALS OF ARTIFICIAL FARMYARD MANURE AT LINCOLN COLLEGE.

M. J. SCOTT, B.A., B.Sc., A.I.C., Canterbury Agricultural College, Lincoln.

FOLLOWING an unsuccessful trial of artificial farmyard manure (A.F.Y.M.) with mangolds in 1924–25, figures are now available from a repetition test in the past season. Owing to the wet winter of 1925 it was impossible to get the ground in order for sowing before 17th November. The mangolds were pulled on 17th June, 1926. The manure was applied at the rate of thirty-five loads, equivalent to 20 tons per acre, in August, 1925, but was not ploughed in until the end of September owing to the wet weather.

The plan of the experiment was as follows: Adjacent strips, 8 yards wide, running the whole length of the field, were manured with (1) A.F.Y.M., (2) bullock-dung, and (3) no dung. These were repeated across the field six times. At harvest six weighings were made in each strip off six consecutive chains in a row chosen at random, making thirty-six weighings in each trial.

The method of comparison used was that known as "Student's," which was explained by Dr. Hilgendorf in the January, 1925, issue of this *Journal*, the results being as follows:—

Manure.	Yield in Tons per Acre.	Increase per Cent.	Odds in Favour of Significance.
		Over Control.	
A.F.Y.M.	12·1	12·1	58 to 1
Control	10·8	..	..
Dung	11·67	16·7	170 to 1
Control	10·0	..	..
		Over Dung.	
Dung	10·3	..	..
A.F.Y.M.	10·4	1·0	>1 to 1

The low yields are extraordinary, and are probably due to the lateness of sowing and the condition of the ground. In an adjoining lea paddock, on a slight rise, the yield was 30 tons per acre. This paddock had been used as a right-of-way for stock for some years, and was tramped hard. It is suggested that on this account, and because it was higher, most of the rain ran off the surface, and the ground was never waterlogged. The other field had oats and tares on it; the soil was consequently very open, and waterlogging complete.

Wheat has now been sown, with a view to making further estimates of the effect of the treatments on yield.

NOTE.—For previous articles on this subject see *Journal*, February and October, 1925.

Blindness in Sheep.—This trouble (ophthalmia) was noted in some districts during the past year, particularly in the west-coast district of the South Island and in the Nelson and Wanganui districts. Further investigational work is being carried out at the Wallaceville Laboratory.

BLUE LUPINS AS WINTER FORAGE CROP FOR SHEEP.

EXPERIENCE IN MOTUEKA DISTRICT.

F. W. GREENWOOD, B.A., Instructor in Agriculture, Blenheim.

UNTIL quite recently in this country blue lupins were generally considered to be practically valueless as fodder for stock. The writer first became interested in the question of the edibility of this plant through observations made in connection with dairy cattle, which, although in abundance of feed in the flush of the year, forced their way through barbed wires and devoured with avidity blue lupins in stack ready to be threshed for seed. In the autumn of the same year, when the supply of grass was by no means short, cattle devoured a stack-butt of lupin-straw, hardly leaving a straw to mark the original site of the stack.

For several years past farmers on the Moutere Plains, in the Motueka district, have been wintering ewes and wethers on blue lupins. The ground in this locality is extremely light and stony. Prior to the introduction of the practice of feeding the lupins it was usual for the farmers to sow that crop early in February. It was then ploughed in about the end of July, and a crop of oats sown at the end of August, to be harvested for chaff in the following January or February. It is necessary to understand that if Algerian oats are sown in March, as in Marlborough, it is not possible to follow the Marlborough practice of grazing with sheep in May and August in order to encourage stooling, since the ground on the Moutere Plains is not sufficiently good in quality, even when a certain amount of manure (green or otherwise) is applied, to stand the double feeding and still produce a good crop of oats. The practice in the Motueka district now is to feed the lupins off during the winter, then plough in the stubble and the droppings of sheep. In this way a crop of oats yielding 2 tons of chaff per acre is produced, in comparison with a 1-ton crop from land neither treated in this way nor dressed with artificial fertilizers.

The experience of Mr. A. J. Jackett with the feeding-off of the blue-lupin crop by sheep is worth quoting. Mr. Jackett now holds that the blue-lupin and turnip crops form his main winter fodders for sheep. In June, 1925, three hundred breeding-ewes were turned on to 30 acres of lupins. The crop was fed off in two breaks, the sheep being first turned on to 14 acres and left for eleven days. While the sheep were on the lupins, turnips were also fed out to them. Now the practice is to graze them on the turnips, then turn them on to the lupins. In an 8½-acre paddock at Whakarewa two gates—one at each end of the paddock—were opened. One gate led into a grass-paddock and the other into a field of turnips. The sheep remained upon the lupin crop without troubling either the grass or the turnips until the lupins were eaten right down. When Mr. Jackett first started grazing his sheep on blue lupins two ewes slipped their lambs. There is, of course, no valid proof that this had anything to do with the lupin crop, as it might just as easily have occurred in a turnip or a pasture paddock.

FIG. 1. SHEEP FEEDING ON BLUE LUPINS IN AUGUST ON MR. JACKETT'S FARM, MOTUEKA.

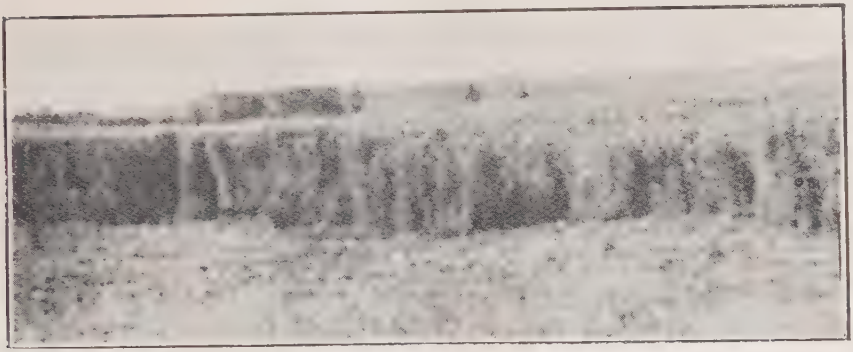

FIG. 2. SHOWING STAGE AT WHICH THE LUPIN CROP IS UTILIZED FOR FEEDING OFF.

Light stony nature of soil is indicated in foreground.

Towards the end of August this year the writer saw on this farm stud Romney ewes, ordinary flock ewes, wethers, and rams all in splendid condition. Quite a number of these animals had been put on to lupins for the first time.

The correct stage at which to feed the blue lupin is either just before or just after flowering. Fig. 1 shows sheep which have come off a turnip-paddock feeding keenly in a lupin crop from 18 in. to 21 in. in height.

The writer does not contend that the lupin crop is one of the best for winter sheep-fodder. This is a matter that requires a good deal of further investigation. Without hesitation, however, he can say that in such a district as that of the Moutere Plains the blue lupin is proving itself a valuable winter fodder.

STRATFORD DEMONSTRATION FARM.

NOTES ON OPERATIONS, SEASON 1925–26.

J. W. DEEM, Instructor in Agriculture, and Chairman Stratford Demonstration Farm Society.

IN 1925–26 the work at the Stratford Demonstration Farm continued much on the lines of previous years. Most of the stumping has now been completed, and more time will be available for clearing up odd corners and tidying up the farm generally.

PASTURES.

These continue to do well, and it is very interesting to see how the better types of grasses, such as rye-grass and timothy, and clovers, are persisting and predominating where the top-dressing and grazing have been carried out under the best conditions. On the other hand, where the grazing has not been properly controlled there is a tendency for cocksfoot and the rougher type of grasses to gain the ascendancy. A good illustration of this is to be seen in Fields 4 and 5, the former having been grazed better than the latter. Another very fine comparison is to be seen in Field 12, where imported wild and colonial-grown clovers are being tested against ordinary imported white. The ordinary imported white has almost disappeared, and the pasture does not seem so palatable and is neglected by stock in comparison with the areas where the colonial and imported wild white are grown. The result is that where the latter clovers were sown the field is beautifully grazed, but where the ordinary imported white was sown there is a tendency for the rougher grasses to get possession. The permanency of imported wild and colonial white as against ordinary imported is very marked, and it is worthy of note that the same results are reported from the Gore Experimental Area in Southland, where a similar trial was laid down in the same year as the Stratford experiments (see *Journal* for July last).

Top-dressing.

Pasture top-dressing continues to give good results. The experiments have been extended to cover comparisons between basic slag and Nauru phosphate (Fields 4 and 5); slag and lime and super (Field 1); slag, basic super, and Rhenania phosphate (Field 3); slag, half super half Nauru, blood-and-bone, steamed bone, super, and lime and super (Fields 8 and 12); slag and basic super (Field 15). In addition to these phosphatic manures, potassic top-dressing with kainit, 30% potash, and sulphate of potash is being tested in Fields 4, 5, and 12.

As has been the case at this farm in former years, slag continues to give the best results. Lime and super and basic super are also doing well; while the Nauru areas in Fields 5 and 14 are giving very satisfactory results.

Areas in Fields 4 and 12 have been top-dressed for the past two years with kainit at the rate of 2 cwt. per acre. This top-dressing crosses several phosphatic dressings in Field 12 and slag in Field 4. So far there has not been any definitely noticeable improvement from

the addition of kainit, nor is there any indication of stock showing any preference for the kainit-treated areas. Field 4, which is getting slag at the rate of 3 cwt. per acre per year (half receiving 3 cwt. every year and half 6 cwt. every second year), is still in splendid condition and shows no sign of deterioration. The area that received the 6-cwt.-per-acre dressing last year was grazed rather better than the 3 cwt. area during the last season, but now that the latter area has been redressed it looks the better of the two. Taking the grazing right through the period there is not much difference, but the result is, if anything, slightly in favour of the annual dressing.

ROOT CROPS.

As usual, several new varieties of roots were tested against standard varieties. These consisted of seven varieties of turnips, seven of swedes, four of carrots, and four of mangolds. While some of them were quite good, in no case did any stand out superior to standard varieties. In turnips, Red Paragon, 46 tons 1 cwt., and Green Globe, 39 tons 14 cwt., per acre, again gave the best results. In swedes, Grandmaster, 35 tons 13 cwt., was best. In carrots, Matchless White, 49 tons 6 cwt., came first, with White Belgian, 47 tons 11 cwt., and Barriball, 43 tons 1 cwt., next. In mangolds, Prizewinner was best, with 55 tons 7 cwt.; Giant Orange Globe second, with 52 tons 11 cwt.; and White Knight third, with 51 tons 5 cwt. The average for all varieties was 51 tons 10 cwt. per acre, against 47 tons 8 cwt. in the preceding year.

The manure used for the main soft-turnip crop was 3 cwt. basic super per acre. There was also a manure test with three phosphatic manures as follows: Basic super, 3 cwt. per acre, yield 39 tons 14 cwt. per acre; two parts super and one part slag, 3 cwt. per acre, yield 43 tons 3 cwt.; two parts super and one part Nauru phosphate, 3 cwt. per acre, yield 41 tons 11 cwt. The crop looked even, and the difference in weight is not significant, being in the radius of probable error in weighing. Basic super, 3 cwt. per acre, was also used for the swede crop.

There was a fair amount of club-root in the swedes, but no appearance of dry-rot in any of the varieties. This is in keeping with the observations made while judging the district field competitions, when fifty-one swede crops were examined and weighed, and in only two instances was dry-rot found, one of these being a second crop grown after a badly affected one. This is gratifying, and it would appear as if the swede crop was to some extent coming back.

The manure used for the main mangold crop was three parts super, one part bonemeal, and one part Nauru phosphate, at the rate of 6 cwt. per acre, plus kainit 3 cwt. per acre. A manurial test was made, using the super, bonemeal, and Nauru in the proportions and weight mentioned above, which may be called mixture No. 1. The variety of mangold used was Prizewinner. The results were as follows:—

	Yield.	Cost for Manure per Ton of Roots.
	Tons cwt.	s. d.
(*a.*) Mixture No. 1 plus 3 cwt. kainit per acre ..	55 7	1 $1\frac{3}{10}$
(*b.*) Mixture No. 1 plus 3 cwt. salt and 1 cwt. sulphate of potash per acre	55 6	1 $3\frac{9}{10}$
(*c.*) Mixture No. 1 plus 3 cwt. salt per acre	54 14	1 0
(*d.*) Mixture No. 1 plus 1 cwt. sulphate of potash per acre	51 5	1 $2\frac{2}{10}$

These results again emphasize the value of salt in the Stratford district, confirming the finding of previous years, which has shown that salt is better than sulphate of potash, and, in fact, that if salt is used potash may be discarded. It is also interesting to note that Mr. J. B. Hine's splendid crop of 111 tons of mangolds (in the farmers' field competitions for 1925–26) was grown with a dressing of 10 cwt. of salt per acre and no potash. Further, an analysis of the mangolds grown in Taranaki and weighed in connection with the competitions shows that eight crops that had salt applied to the land gave an average yield of 63 tons 2 cwt., while twenty-three crops that had potash in some form or other gave an average of 56 tons 2 cwt. The deduction is to use salt for mangolds, or a form of potassic top-dressing such as kainit or 30 per cent. potash, both of which contain large quantities of salt.

The manure used for carrots was super three parts, bonemeal one part, and Nauru phosphate one part, at the rate of 5 cwt. per acre. Carrots seem to do fairly well with most mixtures of manures, and for this reason it is frequently stated that it is not good practice to give carrots a heavy manuring. This is not borne out by the field competitions, which show that twenty-four crops receiving 4 cwt. of manure per acre averaged 43 tons 10 cwt. per acre, and eleven receiving 5 cwt. of manure averaged 53 tons 7 cwt. Position and variety would have some effect, but the figures are significant.

GREEN CROPS.

Oats and tares were again grown for hay and ensilage, the seeding being 2 bushels Algerian oats and 1 bushel Scotch tares. The area for ensilage was sown on 9th October and harvested during the first week in February. The manure used was basic super, 2 cwt. per acre. The green crop weighed approximately 12 tons per acre. This was made into stack silage.

Chou moellier was grown on land that had previously been cropped with swedes, and showed a wonderful resistance to club-root, although the swedes had been fairly bad with that disease. Sowing was done about the middle of November, and the crop was still in good feeding-condition on 15th August. Small areas were also grown for feeding pigs during winter. The results have been good for stores over three months old and for breeding-sows, but small pigs just weaned did not thrive on this crop. The special areas were finished by the end of July, but part of the main crops was being cut and fed in the middle of August, and the pigs continued to do well on it. Seeding was at the rate of 1 lb. per acre. Manure was 3 cwt. basic super, but 4 cwt. would be better.

WEED-CONTROL.

When taken over, most of this farm was badly infested with ragwort, blackberry, and ox-eye daisy. The system of cultivation followed practically cleans these weeds out in two years. The land is stumped, ploughed, and sown in root crops, mostly soft turnips and swedes. Then, as these are fed off, the land is reploughed and sown in oats, or oats and tares, or peas. As soon as these are harvested the land is again ploughed, and another crop of oats, or oats and tares, is sown

—oats and tares for preference. The object is to get two smother-crops in the one year; and if the second ploughing and sowing take place some time in February or early in March weeds have no chance of seeding, and blackberry gets knocked about before it has a chance to re-establish. Heavy crops are required for smothering, and the manuring should therefore be liberal; 2 cwt. basic super or super per acre is used at this farm.

Swedes are one of the worst crops for controlling blackberry, owing to the length of time they are in the ground. On the other hand, they are a very useful crop on new land, and most farmers will prefer to grow them and do the smothering the following year.

DAIRY HERD.

The herd continues to do well. The total butterfat for the year under review, taken from the factory returns, shows an increase of 3·2 lb. per cow and 8·15 lb. per acre. When the exceptionally rough weather experienced last season is taken into consideration this increase is very satisfactory. The following table, showing the butterfat produced per cow and per acre for the last seven years, is interesting. The area of the farm is 143 acres.

Year.	Butterfat per Cow.	Butterfat per Acre.	Total Butterfat.
	lb.	lb.	lb.
1919–20	221·10	60·80	8,694
1920–21	274·27	88·70	12,684
1921–22	298·90	104·50	14,943
1922–23	280·00	98·60	14,099
1923–24	305·00	108·90	15,572
1924–25	327·30	121·30	17,345
1925–26	330·50	129·45	18,514

A very large amount of the above-noted increase is due to top-dressing, and it will be of interest to note that the expenditure this year on manures works out at 14s. 3d. per acre, against 15s. 6d. last year.

GENERAL.

The financial position of the society shows steady improvement, the liabilities having been reduced during the year by £495 11s. 9d.

Farmers continue to visit the farm in large numbers, particularly on special field days.

As mentioned in last year's notes, Mr. W. J. Grierson was appointed farm-manager in July, 1925. During the past season he has carried out his duties in a very efficient manner, as is evidenced by the good returns.

Registration and Inspection of Nurseries.—During 1925–26 a total of 593 nurseries were registered by the Horticulture Division, and £593 collected in registration fees. A fair number of the registrations made apply to persons raising tomato-plants for sale. The Division reports that the bulk of the nurseries were in a clean condition, and no trouble was experienced in carrying out the requirements of the regulations.

SEASONAL NOTES.

THE FARM.

ESTABLISHMENT OF LUCERNE.

NOVEMBER is a favourable month in most districts for sowing lucerne if the land is clean. The ground should be kept constantly stirred right up to the time of sowing, in order to germinate and destroy any weeds. Every precaution should be taken to give the stand a good start, and nothing left to chance. Consequently the ground should be inoculated, unless it is known for certain that this can be dispensed with. The distribution of soil from a vigorous, well-established lucerne plot, at the rate of 3 cwt. to 4 cwt. per acre, should be carried out on a dull day, or in the evening, and the ground well harrowed. If inoculated soil cannot be economically obtained the proprietary culture known as Farmogerm may be used on the seed. The culture method gives fairly good results, but hardly the same satisfaction as soil-inoculation. The land should have been previously limed with at least 10 cwt. of carbonate of lime, or 5 cwt. of burnt lime, but these quantities can be advantageously increased.

A firm and fine seed-bed is necessary, and the seed should not be buried too deeply. A good sample of seed is an important consideration; a good, bright, fresh sample will amply repay any extra expenditure involved, and an old sample should be avoided. On the lighter classes of soil the seed-bed is best finished off with a heavy Cambridge roller, and the seed broadcast at the rate of 15 lb. or 16 lb. per acre, and covered with a light harrowing with the brush harrows. The ground should then be again rolled. On heavier soils the seed may be lightly drilled in 7 in. drills at the same rate of seeding, and lightly covered, but not rolled afterwards. It is good practice to drill half the seed one way and then cross-drill the other half. Where the wide-row method is being followed 10 lb. of seed per acre will be sufficient for 14 in. and 8 lb. for 21 in. rows.

A suitable fertilizer for lucerne-establishment is superphosphate, at 2 cwt. to 3 cwt. per acre, and the addition of ½ cwt of sulphate of potash will generally be found beneficial.

THE RAPE AND TURNIP CROPS.

Land in preparation for late November and December rape crops should be kept well stirred and free from weeds. Speaking generally, the main crop—one of the most important on sheep-farms—will be sown in November. It is often asked whether this fine forage plant can be safely utilized by dairy-farmers. Although rape is admittedly a bad milk-tainter, yet, fed with discretion to the dairy herd, it has been found possible to avoid this trouble and obtain high yields of butterfat. A mixture of peas and oats with rape is preferable, however. Just as the dairy-farmer has learned to feed soft turnips with discretion, he may also learn to feed rape.

Italian or Western Wolths rye-grass for temporary pasture can be sown with rape. The inclusion of 5 lb. to 7 lb. per acre of Western Wolths will be found beneficial for lambs feeding off the crop.

The sowing of hard turnips will demand attention during the coming month. In certain districts, however - of Canterbury in particular -where the grass-grub beetle is prevalent, there is a danger that the strike may be badly affected. In such cases the sowing of the main crop had better be left until about Christmas-time. The majority of the beetles are on the wing from mid-November to mid-December, and sowings of turnips and swedes, also rape, should be arranged accordingly.

MAIZE AND MILLET FOR GREEN FORAGE.

Maize and millet may be sown when danger from frost is past. These are both good crops for the dairy herd during dry autumn weather. Maize for green feed should be sown at the rate of 30 lb. to 60 lb. per acre in 28 in. drills, or broadcast at the rate of 1½ to 2 bushels per acre. Drilling is preferable, as it allows for intercultivation, which ensures a heavier yield under dry conditions. Among suitable varieties are Hickory King and Ninety Day. The seed should be sown at least 1½ in. deep, and guarded as far as possible against birds.

Japanese millet should not be sown too early—any time after the middle of November in the warmer districts, and the first week in December in colder situations. It does well when combined with red or crimson clover. By itself, 15 lb. to 20 lb. of seed per acre in 7 in. drills, or 10 lb. of millet with 8 lb. of clover, may be sown.

Superphosphate, at the rate of 2 cwt. to 3 cwt. per acre, makes a good fertilizer for these two crops on average soils.

CONTROL OF GRASS-GRUB.

Although no effective means of complete control of this pest is known, with good farm-management the destruction caused by the grubs can be greatly lessened. The ravages of the grub are periodic—assuming destructive proportions when a large increase in the number of grubs present coincides with dry-weather conditions. On moist soils often no injury may be apparent, while the grass on poor, dry soils, with an equal number of grubs, is completely killed. Rye-grass suffers more than cocksfoot, while crested dogstail and clovers are rarely attacked. Danthonia is able to survive attack, and on hill country subject to periodic visitations of the grub this grass should always be included in the pasture mixture.

With a really badly infested pasture on ploughable land almost the only procedure to adopt is to plough it up for a spring-sown forage crop. Rape is a particularly good crop for this purpose. The cultivation in October helps to kill the pupæ, and the ground is bare when the beetles are laying their eggs. Grass can be sown after the rape with every chance of success. On dairy farms soft turnips would be the best crop to grow. On a field not badly affected heavy stocking helps to improve the grass left, and this, together with top-dressing, will help the grass to recover.

MISCELLANEOUS.

Many farmers have been doing a certain amount of experimentation in pasture top-dressing with different fertilizers, and the present is a good time to note results. Great care should be taken to examine the quality as well as the quantity of the grass. It requires to be fully recognized that a given weight of a good mixture containing plenty of clovers will have a much greater feeding-value than double the quantity of rough grass. It is also important to note the manure that gives a good steady return throughout the season, as against the one that induces a rush of herbage at first but does not have a lasting effect.

Last season tarweed was very prevalent on pastures in certain Northern districts, and many plants were allowed to seed. In cases of bad infestation the plants should be cut off before seeding by running the mower over the area. Sweet vernal is another weed of pasture land which if mown early before seeding takes place will in time be suppressed. This grass gives a distinct taint to the milk when cows have been grazing on it, and it is one of the earliest grasses to flower.

Where weeds are germinating freely on the ridges of a newly planted potato crop considerable labour may be avoided by a stroke of the tine harrows laid on their back and pulled lengthwise along the ridges. This kills the small seedling weeds and at the same time breaks down the ridges, allowing the sprouts of the tubers to reach the surface more easily.

Established lucerne stands will provide their first cut during the coming month. If not required for green fodder this cut is best made into ensilage.

All implements connected with the operations of haying and ensiling should now be attended to, in order to avoid any delay during the rush of those operations.

—*Fields Division.*

THE ORCHARD.

CULTIVATION AND FERTILIZERS.

It is important that cultivation of the orchards should continue to receive special attention. The ground should be worked down to a fine tilth and kept well stirred to a depth of from 3 in. to 4 in. so as to conserve the soil-moisture and allow free access of air into the soil. To maintain the full benefit of cultivation the formation of a crust, when the land dries sufficiently after rains, should be prevented by stirring the soil immediately it is dry enough to work. Ploughing in the orchard at this time of year is not recommended, as this deeper cultivation will seriously disturb and destroy many of the feeding-roots, which will cause a considerable reduction in the food-supply of the trees at a vital period of their life—that of fruit-setting and stoning. In localities where spring ploughing has not yet been completed owing to the condition of the soil or other circumstances

every endeavour should be made to have it finished as soon as possible, and preferably at a reduced depth.

Growers who intend to make an application of nitrates during the spring to the orchard soil should do so now and during the coming month.

SPRAYING.

Spraying for pests and diseases should be along the lines set out in the orchard notes published in the August *Journal*. The cold wet weather recently experienced throughout the Dominion was favourable to the development of fungi, and in particular black-spot and brown-rot. Growers are urged to make the necessary sprayings at the periods mentioned, and to do the work thoroughly, covering the whole surface of the tree and the fruit with a protective film of spray. It should be remembered that it is just as important to spray the under-side as it is the upper surface. Diseased laterals and twigs should be removed and destroyed. To obtain the best results in the control of apple-leaf hopper it is important that the spray should be applied when the insects are in the nymph form.

DISBUDDING, ETC.

Trees planted during the winter will now be starting into growth, and they should be carefully gone over and only three or four good shoots left about 3 in. or 4 in. apart on the trunk of the young trees. No two or more shoots should be allowed to start from the same point. On two-year-old and older trees planted this season shoots likely to interfere with the proper development of the leaders should be suppressed.

If stocks on which buds have been worked have not already been cut back, this should be done at once so as to encourage a straight trunk or branch. The cut should be slanting, and slightly lower on the side opposite the butt of the bud. In windy situations the shoots should be tied to and supported by stakes driven firmly into the ground, to prevent them being broken off before they become properly established.

Grafts should be examined, and where necessary the ties around the scions loosened so as to prevent the material cutting into them as they swell. Rewax the grafts where required. Pinch back the shoots arising from the stock, except those arising from a suitable position for budding should any of the grafts fail to take. Later in the season, if not required, they also should be pinched back. In exposed situations the scion growths should be tied to protect them from damage by wind. To do this, tie a stake firmly to each branch grafted, and then tie the growths to the stakes.

FRUIT-CASE TIMBER.

As soon as possible after the trees have set their crop an estimate of the number of cases required should be made, and the order placed for early delivery of the shooks so that they may be on hand and dry when required for use.

THINNING OF FRUIT.

One of the many questions that is exercising the minds of the leaders of the industry at the present time is the matter of keeping inferior fruit off the markets. The best way of solving this problem is for growers not to grow inferior and poor-quality fruit. It should be the endeavour of every orchardist to produce a better and higher-quality fruit, and not be a question of how many apples a tree can be made to produce. As a rule, trees will set and mature from two to four times as many fruits as they should be allowed to do, and if the crop is not thinned sufficiently according to the vigour of the trees there will be a large proportion of inferior fruit and a very small percentage of Fancy grade. Those growers who thin their crops regularly will substantiate the statement that there is more money in an average crop of Fancy grade than there is in a heavy crop of small, inferior fruit.

The thinning of sufficient of the fruit at an early stage in its growth is profitable to the grower for the following reasons: (1) Average size of fruit remaining is increased; (2) fruit is more uniform in size and shape; (3) better-coloured fruits are obtained; (4) fruits are improved in quality; (5) less diseased fruits are obtained, because affected fruits would be removed in the thinning; (6) the load of fruit is more evenly distributed over the tree, and this prevents the breaking of branches; (7) it removes misshapen fruits; (8) prevents premature dropping in certain varieties; (9) encourages regular bearing; (10) cost of picking is reduced; (11) less fertility is removed from the soil; (12) maintains the vigour of the trees.

To set rules for thinning is very difficult, as so much depends upon the variety, age of tree and its vitality, soil, cultivation, and climate. Unhealthy or diseased trees should not be expected to mature as much fruit as those which are healthy. The actual operation varies greatly with different fruits. Some growers use a special pair of thinning-shears, while others use their fingers for taking off the fruits. The thinner should go over the tree systematically, limb by limb; method in this work saves much time. Commence by removing diseased, undersized, and blemished fruits, and then thin out to a uniform distance apart. Stone-fruits should be thinned until they are so spaced that no two fruits will touch each other when mature. Thinning should commence as soon as the natural dropping of imperfect fruits, which occurs when the permanent fruits are setting, is over, and when there is no further danger of late spring frosts. Thinning should not be left until the fruit is large, as much of the benefit to be derived from thinning will then be lost.

—W. K. Dallas, Orchard Instructor, Dunedin.

Citrus-culture.

The profitable sale of locally grown lemons is very much affected by the undue amount of low-grade fruit produced. A ready market can usually be found for fruit of good quality, and it is in the interests of the individual in particular and the industry in general that more effort be made to eliminate the low-grade product. Examination of this poor-quality fruit shows that the main causes of inferiority are appearance and lack of keeping-quality.

As regards appearance, the chief defect is roughness caused mainly by verrucosis and coarseness of tree maturity. Verrucosis can be controlled, but only by continuous and methodical spraying. Bordeaux, 4-4-40, is the spray to be most relied upon, but to be fully effective it must be applied as soon as the flower-petals fall and expose the young fruit, which must be periodically covered with spray as development takes place. The lemon-tree, flowering as it does over an extended period, has a constant succession of young fruits. There is, of course, a decided main crop according to variety, to which spray attention is generally given, but much of the verrucosis blemish is developed on the fruits which arise from flowers out of season, and only when a continuity of spraying is done can the maximum of clean fruit be expected. A further detriment to appearance is the lack of clearness of skin, and often a sticky and sooty deposit resulting from the trees being infected with scale insects. Scales on the fruit at once brand it as unmarketable; but a scale infestation on the tree likewise causes blemished fruit, and unless steps are taken to fully control scale insects much fruit of low-grade appearance will be produced. Washing the fruit is at best an unsatisfactory method of overcoming the disfigurement; washed fruit always lacks brightness, and the rind is generally damaged in the process. A spring and autumn application of oil, 1-40, should be made to all trees, but applied when the trees are in active growth to minimize premature leaf-fall.

The coarseness of tree maturity is mainly brought about by allowing the fruit to hang, to become tree-ripe. When fruit is allowed to ripen on the tree not only does the rind become coarse, but the useless pithy part develops to excess. Unfavourable market conditions is the usual excuse given for allowing fruit to hang, but a more easily marketed product would have finally resulted had the fruit been picked when a $2\frac{1}{2}$ in. diameter was attained and cured or even matured off the tree, while at the same time the tree would have been released from the drain of maturing fruit. The keeping-quality of tree-ripened fruit is never good, and no process of curing can make it so; but the keeping-quality of timely harvested lemons can be more fully assured by closer attention to picking and handling so as to avoid all skin punctures.

Under no circumstances should fruit be pulled from the tree, but clippers used. There are several reliable makes of cutters to be had from any reliable ironmonger at a very nominal cost. These are designed with rounded points, and, properly used, will not puncture the fruit. Secateurs are sometimes used, but except in the hands of a most painstaking picker they will ruin a large number of fruits at picking-time. A portion of the stem should be left on the picked fruit, but as short a portion as possible and cut at right angles, not tapering to a point. Long stems left on are the cause of much of the punctured fruit found at present, no doubt by contact in picking-bags or orchard cases.

In all subsequent handlings and transport, handling should be most carefully done, as though bruises may not show to any extent they are most prejudicial to the keeping of lemons.

—W. H. Rice, Orchard Instructor, Auckland.

POULTRY-KEEPING.

MANAGEMENT POINTS.

With the present high cost of foodstuffs the poultry-keeper cannot afford to neglect any detail in regard to the feeding and general management of the flock. He should not try to rear weakly chickens; it never pays to rear birds lacking in vigour.

With the approach of hot weather, more than at any other time, constant warfare must be made against vermin. Do not think that because vermin cannot be seen in the house during the day they are not there. Some of the most dangerous parasitic pests of the fowl work at night and hide themselves during the day. The wise poultry-keeper never waits for vermin to appear. He realizes that prevention is better than cure, and sees that the quarters are maintained in a thorough sanitary state, and that every crack and crevice is frequently sprayed with a strong disinfectant.

The red mite (one of the worst enemies of the fowl) usually first makes its appearances surrounding the perches. It hides under the latter during the day, and attacks the birds at night by blood-sucking. For this reason the perches should be arranged in such a way that they are easily removable, so that every part can be got at by some vermin-exterminator. A good mixture for this purpose is equal parts of kerosene and raw linseed-oil. The mixture should be applied frequently with a brush or a cloth.

Perches should be arranged in such a way that they, or the feathers of the birds, do not touch the walls of the house. They should be fixed in gas-pipes or suspended by wires well away from the walls. In this way, if there are vermin in the walls of the house, they will be prevented to a great extent from getting on to the birds when roosting.

Profits will be reduced by not placing in the broody-coop birds showing the least sign of becoming broody. It should be remembered that the longer the bird is allowed to sit on the nest the longer will it take her to lose the sitting desire and resume egg-laying.

It is important in summer-time that fowls and ducks of all ages be provided with plenty of shade from hot sun.

Much will be lost, but nothing will be gained, by not having a system of toe-marking as a means of ascertaining the different ages and strains of birds when the next season for culling and mating of stock comes round. Neglect to have a distinguishing-mark as an indication of age-determination is responsible for many a good young hen being culled out and old birds retained on the plant. A punch suitable for marking chickens can be obtained at a cost of 2s.

Separate the sexes as early as possible, and market all surplus cockerels when they attain an age of four and a half to five months old. If the most money is to be made out of a cockerel it must be marketed before it commences to produce its adult feathers. Another advantage in marketing cockerels at an early age is that more space is available for the growing pullets.

Do not on any account neglect the growing pullets, or the cockerels intended for future breeding purposes. Wherever possible they should

be placed on clean, fresh ground, and fed and managed to the best advantage. It must be borne in mind that the treatment a bird receives during the growing stage has an important influence throughout its life.

FEEDING ACCORDING TO APPETITE.

Inquiries frequently reach me as to the exact amount of food that should be supplied daily to a given number of birds. This is a question that cannot be answered with any degree of satisfaction, for the one and only safe course is to feed according to the birds' appetite. The rule of weight or measure cannot be fixed, because the birds do not eat the same amount of food each day or at each meal. Their appetites vary according to the season of the year, and whether they are in a laying-condition or not. Obviously, as egg-laying increases the bird will demand a greater food-supply, because it is impossible to get something for nothing.

A half-starved bird is never profitable. There is no danger of overfeeding the heavy layer with the right class of food, provided she is given an opportunity of taking plenty of exercise. The foolish policy so often advocated of keeping fowls on the hungry side with the idea of preventing them from becoming too fat does not hold good where the high-class layer is concerned. It is safe to say that there are more unprofitable flocks to-day due to underfeeding than from any other one cause. Even if food-prices are high, the hen of the right laying-type will return a good profit over her keep.

Many complaints reach me of birds not laying up to the expectation of their owners. This in most cases is due either to underfeeding or the supplying of a food which the birds do not relish. Not only should the food be appetizing, but it must be of sound quality—food capable, after the bodily wants of the bird have been supplied, of enabling eggs to be made from it. Economy in all things connected with the management of poultry should always be kept in view, but the short-sighted policy of stinting the heavy layer of food it will eat is much to be deprecated. Of course, the poor layer or a bird past its most profitable period can be overfed, and these birds will soon declare the fact by developing an overfat condition. This is because they (the poor layers) convert their food into bodily fat, while the heavy layers convert theirs into eggs. The remark is often made, "I think my hens are too fat to lay." In most cases it is not that they are too fat to lay, but rather that they are not concerned in egg-production. Obviously, the keen poultry-keeper would not retain such birds.

The only way of reducing the food bill is to provide an abundance of green feed, which the majority of poultry-keepers can produce themselves. In this connection few realize the value of lucerne as an all-the-year-round food for poultry. If cut in its succulent stage and finely chaffed it provides an ideal green food for birds of all ages when fed in troughs during the day. Well-cured lucerne hay chaffed and steamed overnight will also be found a valuable bulking-material for the morning mash during the off season. It may also be fed to advantage in troughs to birds of all ages. Red clover is also an ideal food to grow for poultry, and may be fed in a similar manner to lucerne.

AN OVARIAN TROUBLE AND THE USE OF MILK.

A correspondent asks for advice as to the cause of several of his birds becoming affected with protrusion of the oviduct. He says that the flock have free range, and are given a mash of pollard and bran for the morning meal, to which meat-meal is included three times a week; for the evening meal wheat is provided. The morning mash is moistened with milk, and, in addition, milk is given in good quantities to drink.

In this case the answer is a simple one—meat-meal is not required at all. The birds, having free range, will pick up sufficient animal life such as worms, &c., to keep them in good laying form, without being provided with such a concentrated forcing diet as meat-meal. To secure a maximum yield of eggs in the late autumn and winter months a heavy meat ration is necessary, but at this period of the year — the natural breeding season for bird-life — it is only courting disaster to overforce birds with stimulating foods. Where milk is available, and especially where birds have free range, no other forcing-food is required for the maintenance of a profitable egg-yield. It should be remembered that milk not only serves as a drink but is a rich food as well. Indeed, the oversupply of milk may easily bring about ovarian troubles such as protrusion of the oviduct and the production of shell-less and double-yolked eggs. The most common mistake made is to compel the laying bird to drink a large quantity of milk merely for the purpose of quenching its thirst. Water in addition to the milk should always be available, so that the bird is not forced to take more of the latter than is good for it.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

LOCATING AN APIARY.

PERHAPS there is no more important question to the beekeeper than location. Upon his ability to select a suitable district in which to start beekeeping will depend his future success. There are few districts in the Dominion where bees cannot be kept in small numbers, but successful establishment of a commercial apiary will largely depend upon knowledge of the nectar-secreting plants. It is generally recognized that the main nectar-flow in New Zealand is produced from white clover and catsear, but it will be found to be a distinct advantage if the apiary is established in a district near patches of native bush or where the golden willow is abundant. Most of the indigenous trees and willows flower early, and the nectar from these sources is very valuable, as it provides ample stores in the spring.

In districts where dependence has to be placed entirely upon white clover a careful watch must be kept on the stores, and very often artificial feeding has to be resorted to in the spring and carried on until the appearance of the clover-bloom. This is often expensive, and can be usually avoided by selecting a site where at least a moderate spring flow may be anticipated. The rich dairy pastures of both the North and the South Island, and localities where cattle-raising is

carried on extensively, provide suitable sites for commercial apiaries. Country which is used for sheep-grazing is not profitable, as the clover pasture is usually eaten bare. Instances have come under my notice where abnormal crops have been secured in purely sheep-country, but they are too infrequent to be taken into consideration, and consequently this class of country should be avoided. Essentially the main requirements are feed and shelter, and if the apiarist is fortunate enough to locate his bees in a position where there is an abundant supply of nectar-secreting plants good shelter can be easily provided.

WATER.

In the absence of a natural supply, water should be provided. Bees require a good deal of water for brood-rearing throughout the whole season, and it often happens that numbers are lost if water is not close at hand. Moreover, bees often become a nuisance at cattle-troughs and by congregating round domestic supplies. Where a large number of colonies are kept it is imperative to see that the bees are well supplied. Many contrivances are used. "Simplicity" feeders make excellent vessels for containing water, but they require to be filled frequently and be occasionally cleansed. Bees prefer to take water from damp situations, and they may often be noticed in numbers sucking water from the ground where there has been any overflow. Feeders should be placed in a sheltered spot in the apiary.

ARTIFICIAL INCREASE.

Artificial increase may be accomplished in several ways, but perhaps the most satisfactory is by means of nuclei and division. A nucleus is best formed of two frames of emerging brood and young bees, one frame of honey, and one containing pollen. This must be completed by a virgin queen or a ripe cell. The nuclei may be utilized throughout the season for the mating of queens for renewal, and at the end of the summer, if two or more are united, or if each one is reinforced by the addition of bees and brood from strong colonies, they may be wintered in safety and will form good stocks for the next season. No surplus can be expected from them the year of their installation.

In dividing it is best to wait till the colony is preparing to swarm and ripe queen-cells appear in the hive. The hive can then simply be split in two by putting half the bees and brood on another stand, taking care to leave queen-cells in each division, and for preference putting as much emerging brood in the half which is to be placed in a new position. This latter precaution is necessary in order to make up the wastage from the field-bees that will return to the old stand. Each hive can then be completed by filling the vacancies by drawn-out combs. The queen-cells in the queenless half will be nursed by the young bees, while those in the half containing the queen will be torn down by the bees when they find the hive depleted. If the apiarist wants to be quite sure of this being done he may search for the queen and remove her while the division is being made, afterwards putting her in the hive on the new stand. The division method is advocated on account of its simplicity and the fact that there is no necessity for finding the queen before the operation. It is a most effectual preventive of swarming, and saves a great deal of trouble where increase is desired.

SUPERING.

In most districts November is early enough for the employment of supers, though much depends on weather conditions. If the weather is warm, the hives full of bees, and nectar coming in freely, the supers may now be added at any time. However, it is of no use discouraging the bees by giving additional space before the weather is warm enough to justify it. If increase is required it is as well to confine the bees to one story till the hive is overflowing with bees. This is almost certain to produce a desire to swarm, and the hive can then either be allowed to swarm naturally or be divided artificially. When the first super is put on it is best, if possible, to fill it entirely or partially with drawn-out combs. If only foundation is available, one or two combs—not containing brood—may be removed from the bottom story to the top, and sheets of foundation put in their place. On no account disturb the brood until settled weather eventuates. If foundation is used in the super, queen-excluders should not be used, as the bees will rarely travel through the excluders to work the foundation, and will usually swarm. Do not bring excluders into use until the bees are quite accustomed to working in the supers.

—E. A. Earp, Senior Apiary Instructor.

HORTICULTURE.

TOBACCO GROWING.

In the spring of last year when the tobacco-plants were all out in the field there was serious loss in many crops due to cut-worms, a popular name given to the larvæ of many different moths which live in the soil and feed on the young plants at night. Their destructive habit of eating the young plants off at the surface of the ground is sometimes sufficiently extensive to cause serious loss. The trouble is worse where the land has had only a brief preparation, as with longer fallow and more cultivation they have not the same opportunity to become established, and numbers are destroyed by birds. In the case of bad attacks the poison bait described in last month's notes may be used.

The shallow-rooting habit of the tobacco-plant demands careful cultivation at the present time, but care must be taken to maintain a fine tilth and destroy all weeds before they attain any size. If this is done now the expensive hand hoeing necessary when the plants are larger may be reduced to a minimum. During fine weather after rain is a particularly suitable occasion for this cultivation work if the land is sufficiently dry.

Of other dangers in the field high winds and hailstorms are the worst. In many instances it is worth while planting a high-growing crop of some kind alongside as a protection from prevailing winds, so important is it that the leaves should be well grown and free from bruising and torn edges that prevent a full maturity and development of a suitable texture.

THE TOMATO CROP.

On the main tomato crop under glass the lower bunches will now be ripening, and the plants will be well up the strings on which they are trained. This mass of foliage and the increasing sun-heat make it necessary to give careful consideration to ventilation if the plants are to be kept healthy and hardy and a suitable dry atmosphere is to be maintained. This attention is specially necessary in the early morning of fine hot days. About the time of the first picking—which usually takes place towards the end of November—it is customary to trim off and carry out the lower leaves that shade the ripening bunch, and on well-drained soils that are likely to become overdry a straw mulch of stable litter is now applied. The forcing manures that have been carefully avoided previously may, now that a number of fruit branches have set, be applied from time to time in a liquid form to help the swelling bunches.

Planting the outside tomato crop is done in most districts at about this period. A good bordeaux spray is often suitable treatment for the young plants before they are removed from the boxes. It not only prevents fungous disease, but is a considerable deterrent to insect pests by making the growth unpalatable. Carefully scrutinize each plant before putting it out, discarding those that are blind or untrue to type, soft, or stunted. The early paying crops can be obtained only by setting out good plants at the proper stage of growth. Plant them firmly and rather deep.

BERRY FRUITS.

The strawberry and gooseberry harvest will begin very shortly. Regarding the former, it is opportune to mention the need of picking the fruit when plants are free from surface moisture. Pick the fruit with a short stem attached, and let the picker carry a set of punnets and grade the fruit as it is picked. Avoid topping up with selected fruits—it is illegal. Fill the punnets and place them in a cool shady place while awaiting shipment.

Plantations of loganberries and raspberries will now be growing new canes. Those required for next season's fruiting will be all the stronger if the weak and badly placed new growths are removed now.

VEGETABLES AND POTATOES.

For winter supplies sow now late brocolli, savoys, and kale; or in the warmer districts sow the autumn and hardier cauliflowers in the place of broccoli, as they have the advantage of a much earlier maturity. Make these beds on good, moist land, and sow them thinly. In no class of vegetable-seeds is there such a wide range of quality as in the above mentioned. Needless to say, the best results can only be obtained by using first-class seed-strains. Asparagus-beds must not be allowed to become dry at this season. An ounce of nitrate of soda to each 4 gallons of water is an excellent stimulant now for this crop. Carefully inspect the early potato crop when in flower, and mark down sufficient of the best plants for seed tubers.

—W. C. Hyde, Horticulturist.

TESTING OF PUREBRED DAIRY COWS.

AUGUST–SEPTEMBER CERTIFICATE-OF-RECORD LIST.

Dairy Division.

THE appended list comprises particulars of performance of those cows which received certificates during August and September.

A NEW JERSEY CLASS-LEADER.

The outstanding performance recorded is undoubtedly that of the senior two-year-old Jersey, Ivondale Golden Rainbow, whose certificated yield of 768·46 lb. butterfat places her at the head of her class for the breed, her production exceeding that of the previous class-leader—Mr. W. J. Chynoweth's Marshland's Stylish Princess—by the good margin of 52·71 lb. fat.

Ivondale Golden Rainbow was bred and tested by Mr. P. J. Petersen, of Brixton, near Waitara. She commenced her test at the age of 2 years 311 days, and the period between her date of calving for commencement of test and date of calving subsequent to test was 433 days. She was milked only twice daily during the whole of her lactation period. One of the conspicuous features of her performance was the manner in which her yield was maintained throughout the whole of the test. Her highest monthly yield was for her first full month (a thirty-one-day month), in which she gave 71·95 lb. fat from 1,177·7 lb. milk. For the last month of her test (thirty days) she is credited with 58·42 lb. fat from 890·6 lb. milk. Her lowest individual test was 5·60 per cent., and her highest 6·56 per cent., her average test for the season being 5·92 per cent. She also has a C.O.R. for 454·89 lb. fat in the junior two-year-old class.

The sire of Ivondale Golden Rainbow is Aster's Golden Lad, and the dam is Ivondale Rainbow's Lass, who has two certificates of record, one for 358·20 lb. fat on a test commenced under two years of age, and one for 455·43 in 202 days at a commencing-age of 4 years 346 days. Aster's Golden Lad is sire of five C.O.R. daughters, including the junior two-year-old Ivondale Gold Star, 506·97 lb. fat, and Ivondale Golden Lass, a senior two-year-old with 601·62 lb. fat. The sire of Aster's Golden Lad is Viola's Golden Laddie, the well-known imported bull, and sire of twenty-one C.O.R. daughters. Ivondale Rainbow's Lass is sired by Ivondale's Rainbow, a bull of Mr. Petersen's breeding, who has six C.O.R. daughters, including one with over 600 lb. fat. The dam of Ivondale Rainbow's Lass and maternal granddam of Ivondale's Golden Rainbow is Ivondale's Queen of Belgium, who has a C.O.R. for the outstanding record of 738·85 lb. fat.

There are many well-known and proven animals represented in the pedigree of this new class-leader, and judging by the performance of this and other members of Mr. Petersen's herd he has builded on good blood lines. K.C.B., Belvedere Bilberry's Last, Rainbow, Belvedere Sunbeam, and Starbright are a few of the better-known names. At the close of her testing-period Ivondale Golden Rainbow was purchased by Mr. Truby King, of Stratford.

LIST OF RECORDS.

* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.	Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Jersey Lea Vi ..	S. Bowker, Ihakara, Levin ..	1 357	240·5	365	9,208·1	469·91
Gowanlea White Socks	J. Robb, Wanganui ..	1 328	240·5	365	8,233·6	461·30
Gowanlea Jewel ..	J. Robb, Wanganui ..	2 9	241·4	345	8,646·0	452·55
Jersey Lea Rose Leaf	S. Bowker, Ihakara, Levin ..	2 0	240·5	365	8,245·5	442·93
Distinction's Melba ..	W. T. Williams, Pukehou ..	1 352	240·5	349	7,373·2	426·77
Rioter's Lass ..	J. Hale, New Plymouth ..	1 268	240·5	339	7,234·5	422·59
Vernon Charming Primrose	G. R. and H. Hutchinson, Auckland	1 321	240·5	365	7,234·1	417·80

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS—*continued.*						
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Middlewood Lola	F. W. and H. M. Clough, Inglewood	1 326	240·5	365	6,093·4	408·25
Matchless Violet	F. J. Watson, Bull's	2 10	241·5	333	6,826·6	407·06
Bridge View Sweet Pea	A. L. Hooper, Mahoe	2 24	242·9	328	6,859·5	403·79
Swan's Fox's Crocus	Brakenridge and Pearson, Taupaki	2 66	247·1	365	7,342·7	401·48
Poneke Swan's Girly	C. S. Leggett, Motumaoho	2 8	241·3	365	7,143·6	397·75
Llangollen Honeybird	J. T. Entwisle, Cambridge	1 358	240·5	365	5,999·3	394·11
Orange Dale Rose	W. J. Hall and Son, Matatoki	1 320	240·5	365	6,700·9	393·73
Maiden's Hopeful	J. J. Goodwin, Morrinsville	2 21	242·6	328	7,950·8	393·24
Ku Ku Topsy	W. Devine, Palmerston North	1 313	240·5	356	7,217·9	391·88
Olga of Bull's	F. J. Watson, Bull's	1 356	240·5	331	6,471·0	377·34
Some Flapper	J. E. Rae, Taneatua	1 359	240·5	365	6,668·3	370·79
Derry's Lucky One	S. J. Robinson, Hinuera	1 354	240·5	333	6,401·9	350·93
Vixen's Golden Sunshine	R. E. Clements, Awakino Point	1 337	240·5	343	6,331·3	347·97
Tirohia Majestic Star	B. E. Veale, Tirohia	2 8	241·3	365	6,954·2	342·17
Remuera Boquet	G. F. Edwards, Midhirst	2 73	247·8	296	5,750·5	329·76
Hilltop Light	F. C. Butt, Opotiki	2 24	242·9	291	5,695·7	321·88
Mountain Meadow's Creeper	F. C. Butt, Opotiki	2 4	240·9	279	6,181·8	310·20
Lucina's Cream	F. C. Butt, Opotiki	2 3	240·8	305	7,030·3	302·89
Glen-Leam Fancy	C. Flowerday, Morrinsville	1 210	240·5	349	5,252·8	296·45
Marshlands Model	A. E. Peppercorn, Cambridge	1 307	240·5	365	4,135·4	295·73
Ashton Pearl	G. R. and H. Hutchinson, Auckland	1 316	240·5	342	5,441·3	295·60
Green Park Lass	H. E. Walters, Waitoa	1 361	240·5	320	4,948·8	267·02
Mountain Meadow's Pet	F. C. Butt, Opotiki	2 47	245·2	303	5,009·8	258·33
Senior Two-year-old.						
Ivondale Golden Rainbow	P. J. Petersen, Waitara	2 311	271·6	365	12,962·2	768·46
Wairere Countess	A. Faull, Stratford	2 353	275·8	362	10,882·5	693·11
Miro Meadows May	J. D. Morison, Ngaere	2 356	276·1	365	10,376·1	610·01
Pelynn Chloe	L. K. Tarrant, Ngaere	2 269	267·4	364	8,705·0	602·13
Snow View Blossom	A. J. Miller, Uruti	2 325	273·0	303	7,265·7	466·45
Fox's Snow Queen	G. Bright, Otaua	2 312	271·7	365	9,372·9	452·21
Llangollen Beauty	J. T. Entwisle, Cambridge	2 356	276·1	365	9,504·2	431·90
Arden Viola's Bess	R. W. Ferris, Masterton	2 320	272·5	311	6,619·6	418·25
Lady Iva	W. Robinson, Patumahoe	2 332	273·7	301	8,110·8	411·60
Glyndyfrdwy Girl	H. E. Walters, Waitoa	2 334	273·9	316	6,942·7	343·97
Hua Brook Golden Maid	T. H. Western, Bell Block	2 322	272·7	327	5,696·9	333·95
Matchless Gold of Bull's	F. J. Watson, Bull's	2 346	275·1	365	6,160·4	329·26
Reid Park Miss Elizabeth	A. H. Wright, Otaua	2 334	273·9	275	5,017·5	306·31
Three-year-old.						
Speck's Marigold	J. Torbet, Waiau Pa	3 331	310·1	365	10,132·9	530·65
Onaero Sunshine	J. D. Morison, Ngaere	3 322	309·2	365	8,385·8	498·34
Beresford Prim	T. Brownlee, Pukekohe	3 308	307·8	352	7,350·6	486·46
Almadale Be Be	J. K. Watson, Tatuanui	3 232	300·2	365	8,759·2	483·65
Hua Brook Dulcet	H. Salway, Bell Block	3 341	311·1	309	8,717·3	451·54
Gift's Viola	F. Phillips, Otorohanga	3 303	307·3	365	8,371·3	424·98
Woodlands Melba	T. H. Western, Bell Block	3 340	311·0	348	6,934·7	395·88
Belvedere Radiance	R. W. Ferris, Masterton	3 361	313·1	280	7,795·4	393·45
Marshlands Dora	W. Bottomley, Waihou	3 227	299·7	359	7,395·8	386·89

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Three-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Rosebrae Queen ..	J. Blake, Puni ..	3 27	279·7	349	6,749·8	378·06
Florrie's Luckie ..	A. E. Sly, Whakaronga ..	3 364	313·4	329	8,440·8	363·01
Marshlands May Queen	W. Bottomley, Waihou ..	3 360	313·0	360	6,535·0	338·73
Earlston Violet ..	Chisholm Bros., Hunterville	3 271	304·1	283	5,782·5	307·08
Four-year-old.						
Woodlands Jeanette..	H. E. Watkin, Takanini ..	4 320	345·5	365	10,259·1	609·61
Crofton Sweet Molly..	F. W. and H. M. Clough, Inglewood	4 338	347·3	365	8,146·1	536·93
Ivondale Rainbow's Lass	P. J. Petersen, Brixton ..	4 346	348·1	202	8,260·3	455·43
Lad's Fairy ..	A. E. Peppercorn, Cambridge	4 13	314·8	365	7,620·7	430·73
Holly Oak War Nurse	T. H. Western, Bell Block..	4 213	334·8	262	6,212·8	399·35
Mature.						
Mason's Armistice ..	R. Waterhouse, Ardmore ..	5 225	350·0	365	11,122·7	726·01
Wairere's Dairymaid	A. Faull, Stratford ..	6 7	350·0	361	10,821·6	670·67
Lyndon Mantilla ..	E. Feilding, Drury ..	5 319	350·0	365	11,005·6	639·19
Lyndon Flower Girl	S. J. Robinson, Hinuera ..	6 310	350·0	358	9,991·0	626·78
Rockview Pride ..	G. R. and H. Hutchinson, Auckland	5 4	350·0	361	9,783·8	555·90
Trelawny Buttercup..	J. Mitchell, Woodville ..	8 363	350·0	351	10,474·5	509·71
Cedar	J. S. Barrowclough, Morrinsville	7 317	350·0	365	8,434·1	472·13
Bilberry's Joy ..	H. G. Lever, Tauranga ..	6 318	350·0	357	8,773·8	438·82
Diamond's Dawn ..	C. S. Leggett, Motumaoho..	5 295	350·0	365	9,123·3	437·19
White Velvet ..	J. S. Barrowclough, Morrinsville	7 350	350·0	285	5,898·6	414·39
Jewel's Sapphire ..	H. G. Lever, Tauranga ..	6 201	350·0	309	6,976·8	407·95
Jersey Bank Daisy ..	A. J. Miller, Uruti ..	7 313	350·0	308	8,562·0	390·65
Glyndyfrdwy Beauty	H. E. Walters, Waitoa ..	5 294	350·0	321	8·044·2	375·08
	FRIESIANS.					
Junior Two-year-old.						
Woodlands Pontiac May 6th*	Smart and Sons, Tikorangi	2 169	257·4	365	14,444·5	599·15
Castlemere Corona Beets*	J. W. Cole, Horsham Downs	1 296	240·5	356	17,697·4	488·83
Livingstone Lady Mierlo	W. J. Eames, Hunterville ..	2 142	254·7	355	12,170·3	427·92
Lichfield 28 ..	W. J. Polson, Fordell ..	1 348	240·5	365	11,740·4	412·35
Junior Three-year-old.						
Lichfield Lady ..	W. J. Polson, Fordell ..	3 9	277·9	363	13,770·6	501·25
Brundee Bonheur ..	C. Boyce, Tatuanui ..	3 33	280·3	343	9,846·1	343·57
Senior Three-year-old.						
Cluny Pietje Hope 13th*	O. A. Cadwallader, Greytown	3 212	298·2	348	16,584·0	618·40
Omaha Spot ..	A. Migounoff, Matakana ..	3 350	312·0	353	12,354·5	492·69
Senior Four-year-old.						
Brookfield Pietertje Flo*	J. W. Cole, Horsham Downs	4 332	346·7	304	16,931·9	503·72
Lichfield Seven ..	W. J. Polson, Fordell ..	4 354	348·9	365	15,651·6	478·63

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS—*continued.*	Yrs. dys.	lb.		lb.	lb.
Mature.						
Waihi Girl* ..	J. E. O'Shea, Ohangai ..	8 6	350·0	346	18,463·0	628·78
Brookfield Constance Paxton	A. Migounoff, Matakana ..	5 223	350·0	314	16,576·7	609·87
Lichfield Three ..	W. J. Polson, Fordell ..	5 1	350·0	363	15,215·6	477·43
Ashlynn de Kol ..	W. J. Polson, Fordell ..	8 6	350·0	365	10,905·5	455·58
	MILKING SHORTHORNS.					
Junior Two-year-old.						
Ridgway Tulip* ..	E. Ridgley, Waiuku ..	1 364	240·5	365	9,894·2	430·56
Senior Two-year-old.						
Matangi Quality 5th*	Ranstead Bros., Matangi ..	2 204	260·9	365	11,752·8	542·66
	AYRSHIRES.					
Two-year-old.						
Glengyle Mountain Lily	McAdam Bros., Queenstown	2 36	244·1	288	6,045·5	250·00
Mature.						
Kathleen of Edendale	W. Hall, Lepperton ..	5 22	350·0	365	10,646·0	447·56
	RED POLLS.					
Mature.						
Tourist	B. W. Harvey, Waverley ..	7 263	350·0	280	9,674·5	379·27

Second-class Certificates.

Jerseys.

Junior Two-year-old.						
Briar Rose's Brilliant	F. Phillips, Otorohanga ..	1 231	240·5	365	7,183·5	326·85
Tirohia Briar Berry ..	B. E. Veale, Tirohia ..	1 178	240·5	365	4,898·7	296·25
Corra Lynn Roseleaf	A. Best, Bombay ..	2 60	246·5	365	4,165·6	257·32
Senior Two-year-old.						
Odd Trick	S. Dale, Fairlie	2 327	273·2	365	9,327·2	581·45
Palmdale Majestic Queen	D. Kennedy, Morven ..	2 135	254·0	365	7,785·2	550·15
Xenia's Juillette ..	S. Dale, Fairlie	2 362	276·7	20	4,830·7	318·55
Mature.						
Melia Ann's Last ..	J. Klenner, Kaimata ..	6 291	350·0	365	9,774·0	650·19

Friesians.

Senior Two-year-old.						
Coldstream Pontiac Colleen*	O. A. Cadwallader, Greytown	2 299	270·4	365	16,777·0	649·90
Junior Three-year-old.						
Taumata Abbekerk Cornella*	Mrs. A. M. Budd, Carterton	3 73	284·3	365	7,796·6	689·85

WEATHER RECORDS: SEPTEMBER, 1926.

Dominion Meteorological Office.

GENERAL SUMMARY.

SEPTEMBER, the first month of spring in New Zealand, this year presented samples of all the seasons. The outstanding feature, however, was one of the most extensive snowstorms within memory. The falls were not heavy, but fairly general over the Dominion southward of Raglan and Tauranga. One observer, however, states that it was the heaviest known on the east coast of the North Island for forty-six years; 4 in. fell at Havelock North and 2½ in. at Masterton. Our observer at Hokitika says that 1 in. measured there was the only fall of snow remembered in the town itself for thirty years. The storm on the 16th was accounted for by a westerly or "antarctic low," and was followed by a very sharp frost on the morning of the 17th. Heavy west to south-west gales were recorded at this time, and the middle part of the month was remarkable for rough wintry weather.

The first week of the month was showery, and the last fine and warm, with beneficial rainfall at the close. Bright sunny days alternated with frosty nights along the east coast during the greater part of the month.

The rainfall for the month was below the average for September, especially on the east coast of both Islands, but it was considerably above the average on the west coast southward of Ross, and over Otago and Southland.

RAINFALL FOR SEPTEMBER, 1926, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·22	13	1·10	4·75
Russell	2·29	11	0·45	3·42
Whangarei	3·21	15	0·55	4·88
Auckland	2·87	16	0·52	3·65
Hamilton	3·44	13	1·22	4·37
Kawhia	4·30	16	1·60	4·39
New Plymouth	2·82	17	0·74	5·27
Riversdale, Inglewood	5·17	14	1·06	9·48
Whangamomona	5·03	17	0·85	7·57
Tairua	3·08	11	0·52	4·64
Tauranga	3·09	11	0·68	4·41
Maraehako Station, Opotiki ..	1·74	10	0·64	4·28
Gisborne	1·11	6	0·47	3·01
Taupo	3·05	9	1·38	3·71
Napier	0·73	9	0·30	2·19
Maraekakaho Station, Hastings ..	1·24	13	0·60	2·58
Taihape	2·23	14	0·54	3·44
Masterton	2·05	13	0·51	3·13
Patea	2·06	10	0·57	3·63
Wanganui	1·36	9	0·47	3·05
Foxton	2·86	10	1·20	2·43
Wellington	1·94	14	0·44	4·02
South Island.				
Westport	3·95	22	0·95	6·82
Greymouth	6·43	21	1·53	8·26
Hokitika	8·74	21	1·74	9·33
Ross	14·84	19	3·42	13·06
Arthur's Pass	15·30	17	3·85	14·96
Okuru, Westland	15·20	19	3·43	12·48
Collingwood	5·49	12	1·41	10·13

RAINFALL FOR SEPTEMBER, 1926—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Nelson	2·43	9	0·97	3·75
Spring Creek, Blenheim ..	1·76	9	0·55	2·64
Tophouse	5·12	10	1·23	4·81
Hanmer Springs	2·18	11	1·04	4·20
Highfield, Waiau	1·16	7	0·42	3·35
Gore Bay, Cheviot	0·66	4	0·33	4·28
Christchurch	0·63	9	0·20	1·79
Timaru	1·02	9	0·36	2·07
Lambrook Station, Fairlie ..	1·00	6	0·38	2·30
Benmore Station, Clearburn ..	2·68	12	0·60	2·14
Oamaru	1·73	8	0·73	1·69
Queenstown	3·15	11	0·83	2·52
Clyde	0·87	10	0·20	1·06
Dunedin	3·29	17	0·85	2·74
Wendon	3·61	15	0·50	2·12
Gore	4·20	17	0·55	2·52
Invercargill	5·32	18	0·68	3·11
Puysegur Point	7·16	20	1·08	5·53

—*D. C. Bates, Director.*

CONTROL OF DEER.

REFERENCE is made to this question in the 1925–26 annual report of the State Forest Service as follows :—

Since its inception the Forest Service has consistently advocated the control of deer, which have increased at such an alarming rate that their depredations in farming-lands and forests are now widely acknowledged. All Conservators report an increase in the number of these vermin, and the Service is more than ever of the opinion that protection on all species of deer should be removed for a period of at least three years, and that the payment of bounty on killed deer should be continued during that time. Concrete evidence of the attitude adopted towards this pest by settlers residing near infested areas was recently furnished to the Service in a peculiar manner, when the Crookston farmers, who have suffered severely from the depredations of fallow deer for many years, urged delay in the State forestation project in the Blue Mountains in South Otago on the ground that the exotic forests so created would become a refuge for these animals. An impression of how serious the deer menace has become in this district may be obtained from the fact that out of 5,877 deer-tails collected by forest officers in the South Island for the purpose of payment of the bounty of 2s. per tail, 3,890 tails were received from the Blue Mountains area alone.

AGRICULTURAL PUBLICATIONS.

AMONG recent books issued by the University Tutorial Press, High Street, London W.C., are the following : "Agricultural Surveying, including Mensuration, Road Construction, and Drainage," by John Malcolm (5s. 6d.); and "The Principles and Practice of Horticulture," by A. S. Galt (3s. 6d.). "Mechanisms : A Text-book for the Use of Non-technical Students," by Ewart S. Andrews (3s. 6d.), is another new book published by the same house which many farmers would find useful.

Noxious-weeds Order.—The Hokianga County Council has declared foxglove to be a noxious weed within that county.

ANNUAL SHEEP RETURNS AS AT 30TH APRIL, 1926.

TABLE I.—SUMMARY BY SHEEP DISTRICTS.

Class.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams	966	1,073	3,572	906	4,375	2,916	13,808
Other rams	30,557	89,640	76,436	19,348	74,239	66,507	356,727
Wethers	362,910	627,785	719,684	233,274	583,369	685,413	3,212,435
Breeding-ewes	1,192,736	3,379,198	2,931,266	717,866	3,053,533	2,673,653	13,948,252
Dry ewes	98,600	341,901	222,926	54,458	212,038	149,812	1,079,735
Lambs	558,834	1,796,614	1,395,552	327,223	1,043,768	1,172,045	6,294,036
Totals, 1926	2,244,603	6,236,211	5,349,436	1,353,075	4,971,322	4,750,346	24,904,993
Totals, 1925	2,092,244	6,344,990	5,282,307	1,351,889	4,984,062	4,492,463	24,547,955

TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1917–26.

Year.	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1917	329,230	160,212	6,212	114,778	610,432	3,457,824	13,099,957	1,066,435	7,035,738	25,270,386
1918	325,111	171,437	6,297	125,116	627,961	3,696,520	12,850,597	1,592,452	7,770,772	26,538,302
1919	321,304	165,676	12,196	127,150	626,326	3,922,632	12,176,224	1,799,201	7,304,171	25,828,554
1920	306,621	154,516	9,803	109,454	580,394	3,901,742	11,415,159	1,814,391	6,208,284	23,919,970
1921	322,144	158,608	9,513	110,428	600,693	3,634,799	11,989,180	1,336,306	5,724,053	23,285,031
1922	322,072	154,277	7,259	98,221	581,829	2,727,624	12,341,777	952,789	5,618,240	22,222,259
1923	330,055	172,843	9,013	119,749	631,660	2,551,627	12,890,160	808,919	6,199,073	23,081,439
1924	332,814	179,533	9,727	132,137	654,211	2,807,832	12,896,561	1,036,723	6,381,249	23,775,776
1925	355,579	184,744	7,867	131,485	679,675	3,063,663	13,530,479	875,899	6,398,239	24,547,955
1926	370,535	192,055	10,053	138,526	711,169	3,212,435	13,756,197	1,069,682	6,155,510	24,904,993

TABLE III.—DISTRIBUTION OF THE VARIOUS BREEDS, AND OF CROSSBREDS, IN EACH SHEEP DISTRICT (1926).

Breed.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Total in North Island.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago.	Total in South Island.	Total in Dominion.
Stud sheep (entered in flock-books)—									
Merino	..	1	22	23	10,824	14,164	5,423	30,411	30,434
Lincoln	530	2,555	9,105	12,190	592	202	799	1,593	13,783
Romney	15,882	15,690	79,890	111,462	9,580	5,911	33,816	49,307	160,769
Border Leicester	330	..	468	798	292	10,839	11,860	22,991	23,789
English Leicester	962	627	214	1,803	1,237	16,661	385	18,283	20,086
Shropshire	306	..	1,124	1,430	326	3,176	666	4,168	5,598
Southdown	2,869	7,141	22,563	32,573	805	12,308	1,078	14,191	46,764
Corriedale	508	..	869	1,377	535	32,779	11,277	44,591	45,968
Other breeds	465	560	444	1,469	1,337	3,699	746	5,782	7,251
Totals	21,852	26,574	114,699	163,125	25,528	99,739	66,050	191,317	354,442
Sheep of a distinctive breed but not entered in flock-books—									
Merino	6,517	5,239	15,208	26,964	199,313	391,408	326,710	917,431	944,395
Lincoln	5,025	50,694	18,507	74,226	4,250	15,056	8,650	27,956	102,182
Romney	313,051	1,253,573	753,189	2,319,813	111,102	72,884	382,627	566,613	2,886,426
Border Leicester	4,668	2,562	3,798	11,028	1,160	29,947	48,912	80,019	91,047
English Leicester	2,727	857	632	4,216	7,287	43,255	4,083	54,625	58,841
Shropshire	3,883	1,044	1,486	6,413	1,111	5,129	1,888	8,128	14,541
Southdown	4,917	18,236	34,995	58,148	4,371	16,324	1,989	22,684	80,832
Corriedale	2,770	8,645	39,372	50,787	33,898	448,290	324,265	806,453	857,240
Half-breds	4,238	6,474	10,902	21,614	223,028	619,177	330,140	1,172,345	1,193,959
Other breeds	676	783	1,842	3,301	3,967	6,280	1,626	11,873	15,174
Totals	348,472	1,348,107	879,931	2,576,510	589,487	1,647,750	1,430,890	3,668,127	6,244,637
Crossbreds and others not otherwise enumerated	1,874,279	4,861,530	4,354,806	11,090,615	738,060	3,223,833	3,253,406	7,215,299	18,305,914
Grand totals	2,244,603	6,236,211	5,349,436	13,830,250	1,353,075	4,971,322	4,750,346	11,074,743	24,904,993

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

DISTEMPER IN DOGS.

J. BARKER, Hastings :—

I should be glad if you would give information as to best treatment and effective preventive measures for the malady that has been killing a number of dogs in the South Island recently. The disease is spoken of sometimes as distemper and at other times as influenza in dogs.

The Live-stock Division :—

The disease you refer to, which has been prevalent recently in certain parts of the North Island as well as the South Island, is popularly known as distemper in the dog. It occurs in several forms, the symptoms depending upon the parts involved. It varies from catarrh of the eyes and nose to pneumonia, when the lungs are involved. A gastric or intestinal form is also met with, and occasionally skin-eruptions appear on the inside of the legs. Nervous complications frequently follow, indicated by symptoms ranging from twitching of the muscles to inability to stand. From this it can be understood that treatment depends entirely on the symptoms shown in the particular case. Speaking generally, the disease is ushered in by a rise in temperature, loss of appetite, and dullness. Other symptoms such as coughing, vomiting, &c., develop later. To treat distemper successfully good nursing, combined with warm, well-ventilated quarters, are the two great essentials. To maintain the dog's strength concentrated food in small amounts should be given frequently. Nothing is more useful than Brand's essence of beef, a teaspoonful being given every few hours. A few beaten-up eggs, to which a tablespoonful of brandy and a little milk have been added, should be prepared, and a little of this given three times daily. Fresh milk is good if the dog will take it. Medicinally there is no specific, and for most cases a one-grain quinine pill given morning and evening is as useful as anything else. If the mouth is foul, it may be mopped out with hydrogen peroxide, one part to six of water. The same lotion may be used to cleanse the eyes and nostrils. Dogs recovering from distemper require a long convalescence and nourishing diet. Regarding prevention: During an epidemic dogs must be kept as free as possible from contact with affected animals, and frequent disinfection of kennels, &c., carried out. Success has been claimed from the use of preventive vaccines, but their usefulness has not been established.

LUPINS ; WHITE CLOVERS ; TURNIP-FLY.

J. G. S., Pirinoa :—

(1.) Would you recommend lupins for green-manuring on land with dark soil but clay very near the top—in places coming up with the plough ? If so, what variety of lupin, quantity of seed, best time to sow, and manure to be used ?

(2.) I am sowing a bush-burn this coming year on hill country. Is there any difference in the varieties of white clovers ? If so, which would you recommend ?

(3.) Which months of the sowing season are most immune from the turnip-fly ? Last season the turnips were swept off in the two-leaf stage by the pest.

The Fields Division :—

(1.) We take it your desire is to deepen and enrich the top soil. If so, it would certainly be benefited by green-manuring with lupins, and you would find this method much quicker than the usual practice of gradual improvement by ploughing an inch deeper each time. Sow 1½ bushels annual blue lupin, with 2 cwt. to 3 cwt. super, per acre, early in November. Work the land as for any ordinary crop, and endeavour to obtain a heavy yield for ploughing in. Plough in the crop as soon as the spikes begin to come out in flower ; nothing is gained by waiting longer.

(2.) Use the ordinary New-Zealand-grown white-clover seed. This is much more permanent than imported Dutch, and ranks almost, if not quite, as high as the wild white clover of Britain.

(3.) The first flight of turnip-fly usually takes place some time in November, the actual time varying according to the season. An endeavour should be made to sow so that the turnip-plants will have developed the rough-leaf stage at this time, or else wait until after the flight has taken place. The so-called fly—the large brown beetle, adult form of the grass-grub—damages turnip crops while in the two-leaf stage. The second main flight takes place during February or the beginning of March.

CONTROL OF BLACKBIRDS IN THE ORCHARD.

"IGNOTUS," Remuera, Auckland :—

Can you suggest any method of getting rid of blackbirds? Owing to the by-laws I am unable to use the gun, and their depredations render the growing of peaches almost impossible.

The Horticulture Division :—

The campaign against birds attacking fruit in the orchard should be commenced early in the season, so that the habit of feeding there may be checked. The usual method is to poison the birds with strychnine placed in ripe fruits which are laid on the ground, but a few twigs of good Syrian birdlime would probably be quite a satisfactory control for blackbirds in a small orchard.

REARING MOTHERLESS LAMBS.

"PET LAMB," Silverhope :—

Please inform me which is the best way to rear motherless lambs, and what formula is needed.

The Live-stock Division :—

Motherless lambs are frequently and successfully reared on cow's milk. When this method is adopted the milk should be that of a cow giving a good butterfat test, or, if such cannot be obtained, a little cream should be added to normal milk (not skim-milk). For the first few days only small amounts—two or three tablespoonfuls—should be fed, the feeding being done every two or three hours. The milk should be placed in a bottle the mouth of which is covered by a medium-sized nipple, and the whole warmed to blood-heat (approximately 100° F.). The nipple and bottle should always be carefully cleaned, or digestive trouble will arise among the lambs being fed. Substitutes for milk have been tried, but not generally adopted as they are far from being successful.

FEEDING OF PIGS.

T. WILSON, Otekaike :—

Would you please let me know if pigs turned on lucerne will require any other food, and, if so, what kind and how much? The pigs are about three months old (baconers). Also, can brood sows be turned on lucerne with the young pigs, and what extra feed will they require?

The Live-stock Division :—

Lucerne or any other green forage is not a sufficient ration in itself, but should be supplemented by a light feeding of grain daily for the three-months-old pigs, and increased as they get older. The usual method is to feed from 1 to 3 per cent. of grain, according to age and size. Barley, peas, oats, and maize are suitable grains. Other foods, such as skim-milk and pollard, can be used when available. Breeding-sows with young should have a liberal supply when suckling. Afterwards when dry they can maintain themselves on lucerne or other green forages, but are always benefited by receiving a light ration of the above grains.

BLIGHTED WALNUTS.

J. V. CARLSON, Timaru :—

Could you give me the reason, in connection with a walnut-tree, why the walnut-shells are beautifully formed and look well, yet in most cases they contain only shrivelled nuts, and some are quite empty?

The Horticulture Division :—

Without seeing a sample, one would expect the nuts described to be the result of a late attack of walnut-blight (*Pseudomonas juglandis*). However, in a crop comparatively free from this disease one finds a percentage of blank, shrivelled, or mouldy nuts and dark-coloured kernels. The extent is usually considered to be in proportion to abnormally high temperatures, and to the trees suffering from drought during the latter part of the growing-period, or to trees which for some reason have lost their leaves prematurely. Possibly your trees are growing in unsuitable ground for producing a satisfactory crop of nuts. For this purpose good alluvial well-drained land is required.

FORTHCOMING AGRICULTURAL SHOWS.

Hawke's Bay A. and P. Society: Hastings, 20th and 21st October, 1926.
Poverty Bay A. and P. Association: Gisborne, 26th and 27th October.
Marlborough A. and P. Association: Blenheim, 27th and 28th October.
Wairarapa A. and P. Society: Carterton, 27th and 28th October.
Timaru A. and P. Association: Timaru, 27th and 28th October.
Manawatu A. and P. Association: Palmerston North, 2nd, 3rd, and 4th November.
Waikato A. and P. Association: Hamilton, 3rd and 4th November.
Ashburton A. and P. Association: Ashburton, 4th November.
Northern A. and P. Association: Rangiora, 5th November.
Wanganui A. and P. Association: Wanganui, 10th and 11th November.
Canterbury A. and P. Association: Christchurch, 11th and 12th November.
Royal Agricultural Society and Auckland A. and P. Society: Royal Show, Auckland, 16th and 18th November.
Wallace A. and P. Association: Otautau, 17th November.
North Otago A. and P. Association: Oamaru, 17th and 18th November.
Otago A. and P. Society: Dunedin, 24th and 25th November.
Egmont A. and P. Association: Hawera, 24th and 25th November.
Whangarei A. and P. Society: Whangarei, 24th and 25th November.
Stratford A. and P. Association: Stratford, 1st and 2nd December.
Wyndham A. and P. Society: Wyndham, 10th December.
Horowhenua A. and P. Association: Levin, 25th and 26th January, 1927.
Helensville A. and P. Association: Helensville, 29th January.
Golden Bay A. and P. Association: Motupipi, 1st February.
Feilding A. and P. Association: Feilding, 1st and 2nd February.
Woodville A. and P. Association: Woodville, 4th and 5th February.
Omaha and Pakiri A. and H. Association: Leigh, 5th February.
Te Puke A. and P. Association: Te Puke, 9th February.
Dannevirke A. and P. Association: Dannevirke, 9th, 10th, and 11th February.
Pahiatua A. and P. Association: Pahiatua, 12th February.
Rodney Agricultural Society: Warkworth, 12th February.
Masterton A. and P. Association; Solway, 15th and 16th February.
Buller A. and P. Association: Westport, 18th and 19th February.
Marton A. and P. Association: Marton, 23rd February.
Franklin A. and P. Association: Pukekohe, 25th and 26th February.
Waikato Central Agricultural Association: Cambridge, 2nd and 3rd March.
Morrinsville A., P., and H. Society: Morrinsville, 9th March.
Amuri A. and P. Association: Waiau, 9th March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 9th March.
Mayfield A. and P. Association: Mayfield, 19th March.
Temuka A. and P. Association: Geraldine, 7th April.

Association secretaries are invited to supply dates and location of their shows for publication in this list.